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VOLUME 10, NUMBER 21
NOVEMBER 1, 1977

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 21
NOVEMBER 1, 1977

W77-10101 -- W77-10800

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

GEOCHEMISTRY OF GEOPRESSURED GEOTHERMAL WATERS FROM THE FRIO CLAY IN THE GULF COAST REGION OF TEXAS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-10568

GROWTH RATE OF AN ICE CRYSTAL IN SUB-COOLED PURE WATER,
Syracuse Univ., New York. Dept. of Chemical Engineering and Materials Science.
J. P. Kallungal, and A. J. Barduhn.
AIChE Journal, Vol 23, No 3, p 294-303, May 1977. 11 fig, 2 tab, 36 ref. OWRT 14-30-3124.

Descriptors: *Crystal growth, *Ice, *Laboratory tests, *Model studies, Mathematical models, Temperature, *Water properties, Convection, Flow, Velocity, Instrumentation, Equipment, Freezing, Rates, Crystals, Ice-water interfaces, Physical properties.
Identifiers: *Ice crystal growth.

New and extensive experimental data on the rate of growth of ice crystals in the a axis direction in quiescent and slow flowing subcooled pure water show conclusively that thermal natural convection is an important heat transfer mechanism controlling the growth rate. At zero and low forced velocities, steady growth is observed only when the crystals grow horizontally or upward. Steady downward growth does not occur in quiescent water. This is consistent with the physical properties of water and the phenomenon of thermal natural convection. Growth rates at high water flow rates vary as the square root of the forced velocity and the 3/2 power of the subcooling and follow the theory of Fernandez and Barduhn with the ice-water interfacial energy set at 52 mJ/sq m (52 erg/sq cm). (Sims-ISWS)
W77-10796

2. WATER CYCLE

2A. General

STOCHASTIC MODELS FOR PRECIPITATION,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 2B.
W77-10180

LAW OF PROBABILITY FOR TWO LOW WATER VARIABLES,
Direction des Eaux, Baja (Hungary).
For primary bibliographic entry see Field 2E.
W77-10297

THE USE OF MATHEMATICAL MODELS FOR FORECASTING IN HYDROLOGY AND METEOROLOGY,
Electricite de France, Grenoble. General Technical Div.
P. Guillot.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 266-276, 1974. 3 fig, 22 ref.

Descriptors: *Forecasting, *Hydrology, *Meteorology, *Probability, *Precipitation(Atmospheric), *Evaluation, Low flow, Rainfall, Runoff, Daily, Seasonal, Floods, Temperature, Mathematical models, Equations, Systems analysis.
Identifiers: Multiple regression, Hourly, 'Gradex' method, Western Europe, North Atlantic, Graphical correlation methods.

Described are practical forecasting models applied by Electricite de France. The multiple regression computation is applied to the following types of forecast: (1) long-term forecasting of runoff volumes and the subsequent evaluation of low-water flows, based on monthly rainfall and temperature; (2) short-term flood forecasting, based on antecedent daily or hourly rainfall, antecedent runoff and eventually a seasonal parameter; (3) extreme floods' probability, evaluated by the 'Gradex' method, in which extreme daily (or hourly) flow and extreme daily (or hourly) rainfall distributions are extrapolated together, both being assumed to decrease exponentially according to e-xa (a is called 'Gradex'); and (4) forecast of local daily rainfall, one and two days ahead, by multiple correlation of rainfall versus pressure at ground level, and 1000-700mb thickness, inside a sample of analog days, selected by pattern recognition of the 700mb level over Western Europe-North Atlantic. Graphical correlation methods--including 'co-axial relations'--are considered to be subjective and ineffective. The main point in computing multiple regression is that it allows rapid selection of the most useful variables for the forecast and the principal part of the natural model to be isolated, even if it is nonlinear. A satisfactory linear approximation can be achieved by means of simple transformations. Deterministic models are merely considered to be inventories of links pointing to possible correlations, rather than as representing actual forecasting models. Nothing is gained in relying exclusively on over-detailed physical schemes of debatable usefulness; a reliable choice of variables is much more critical than the exact analytical form of the relations. (Bell-Cornell)
W77-10298

ANALYSIS OF THE STOCHASTIC COINCIDENCE OF CERTAIN HYDROLOGICAL PROCESSES,
For primary bibliographic entry see Field 2E.
W77-10299

A STOCHASTIC MODEL FOR THE SIMULATION OF THE TEMPERATURE OF A WATERCOURSE,
Electricite de France, Chatou. Div. Exchanges Atmospheriques.
R. Gras, and J. P. Henry.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 326-332, 1974. 3 fig, 3 ref.

Descriptors: *Rivers, *Water temperature, *Simulation analysis, *Stochastic processes, *Monte Carlo method, Thermal water, Thermal powerplants, Seasonal, Meteorology, Behavior, Downstream, Atmosphere, Data collections, Equations, Mathematical models, Systems analysis, Thermal pollution.
Identifiers: Heat exchange, White noise.

The structural study of chronological series of river temperatures and of meteorological variables governing the phenomena leading to those temperatures allows the generation of temperatures and meteorological variables (such as wind velocities) series by a Monte-Carlo method in order to simulate river thermal behavior downstream from a river-cooled thermal power plant when observed data sequences are too short. The water temperature is considered as the sum of a deterministic component with structure given by a stationary Markovian process of the first order. The heat exchange coefficient between water and atmosphere, computed from the meteorological variables, although by nature not purely random, is represented by a white noise which distribution is a Pearson law III. The procedure, applied to a physical example, allowed limits to be set to the duration of the period of field data collection. (Bell-Cornell)
W77-10300

PROBABILISTIC MODELS FOR MULTIPLE AND SYNTHETIC HYDROLOGIC VARIABLES,
Electricite de France, Chatou, France. Service Technologie Generale Applications de l'Electricite et Hydraulique.
J. Bernier.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 333-342, 1974. 2 fig, 1 tab, 5 ref, append.

Descriptors: *Synthetic hydrology, *Probability, *Simulation analysis, *Mathematical models, River basins, Tributaries, Regional analysis, Equations, Systems analysis.
Identifiers: *Hydrologic variables, Autoregressive model, Multi-dimensional model.

Presented is a multi-dimensional first-order autoregressive model for the description of regional hydrological processes, assuming a temporal and regional structure of dependence. The model is useful for the simulation of the tributaries of a basin. (Bell-Cornell)
W77-10301

SOIL AERATION,
Edinburgh Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 2G.
W77-10325

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 6A.
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
Proceedings of the Bratislava Symposium, September 1975. IAHS-AISH Publication No. 115, International Association of Hydrological Sciences, 1975. 283 p, 96 fig, 37 tab, 210 ref. $31.25.

Descriptors: *Water resources, *Hydrology, *Mathematical models, *Simulation analysis, Statistical methods, Dynamic programming, Stochastic processes, Optimization, Flow, Rivers, Reservoir operation, Planning, Design, Forecasting, Rainfall-runoff relationships, Water balance, Water temperature, Control, Monte Carlo Method, Discharge(Water), Groundwater, Systems analysis.
Identifiers: Chance-constrained programming.

Presented are 36 papers concerned with the application of mathematical models to hydrology and water resources systems. A wide variety of modeling areas is covered. Included are: statistical methods for estimating minimum flow; a water balance model; models for optimal multipurpose reservoir operation and simulation models for reservoir design; rainfall-runoff modeling; a model of flood waves; river flow modeling; principles of hydrological forecasting; and many more. Listed are 12 additional papers, received too late for publication, which can be found in Hydrological

Sciences Bulletin, March 1976. The symposium and workshops were organized by the Czechoslovak National Committee for the International Hydrological Programme in cooperation with the International Commission on Water Resources Relations and Systems of the International Association of Hydrological Sciences (IAHS). (See W77-10420 thru W77-10438) (Bell-Cornell)
W77-10419

APPLICATION OF SOME STATISTICAL METHODS FOR THE ESTIMATION OF MINIMUM FLOW,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10420

A YEAR ROUND WATER BALANCE MODEL, ITS APPLICATION AND ITS FUTURE,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
J. Balek.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 6-12, 1975. 1 fig, 2 tab, 6 ref.

Descriptors: *Model studies, *Water balance, *Hydrologic cycle, *Canada, Watersheds(Basins), Hydrologic aspects, Foreign countries, Foreign research, Hydrology, Programs, Computer models, Hydrologic budget.
Identifiers: *Czechoslavakia, *Netherlands, *Zambia.

A year-round water balance model, originally developed at the University of Guelph, was tested on several catchments in three continents under different climatical conditions. In principle, the model was accomplished as a system of interconnected natural reservoirs or zones: (1) surface-biological zone, (2) surface runoff zone, (3) snow pack zone, (4) upper/lower soil moisture zone, (5) groundwater zone, and (6) perched water zone. The model was designed to meet the following criteria: (1) the ability to incorporate data from a great number of catchments; (2) to have a wide application; and (3) compatibility. The following results are expected from the model: (1) a general picture of the hydrological cycle and its components; (2) a continuous water balance of a general catchment for selected time intervals; and (3) the testing of various methods and formulae proposed as characterizing various parts of the hydrological cycle. The results of the application and the future of such water balance modelling were discussed. It was concluded that, as a subject for basic research, modelling has reached a final stage. However, it is not true that further model development should stagnate, because present results show that model theory is ahead of the data and parameters available. Therefore, more attention should be given to work on data and parameter improvement and inputs, both in quality and quantity. (See also W77-10419) (Humphreys-ISWS)
W77-10421

CONSEQUENCES OF GROUNDWATER EXTRACTION ON EVAPOTRANSPIRATION AND SATURATED-UNSATURATED FLOW,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 4B.
W77-10422

MATHEMATICAL MODELLING OF THE RETURN WATERS RUNOFF,
Laboratory of Mathematical Modelling of Hydrological Processes, Sarnigmi, Tashkent (USSR).
For primary bibliographic entry see Field 4B.
W77-10423

THE APPLICATION OF A DETERMINISTIC MODEL TO A SEMIARID BASIN (APPLICATION DU MODELE A DISCRETISATION SPATIALE A UN BASSIN VERSANT SEMI-DESERTIQUE),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
G. Girard.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 104-114, 1975, 4 fig, 2 tab, 4 ref.

Descriptors: *Runoff, *Model studies, *Hydrologic aspects, *Africa, Discharge(Water), Arid lands, Hydrology, Watersheds(Basins), Precipitation(Atmospheric), Rainfall, Simulated rainfall, Foreign countries, Foreign research.
Identifiers: *African Sahel(Mauritania).

Reported herein was the conception of the deterministic model (rainfall-runoff transformation) based upon a gridded map of the basin. Each square of the grid is defined by its physiographic features, its size, and the drainage direction in it. Presented were the applications of this model on the Ghorfa basin located in a semiarid zone of the African Sahel (Mauritania). The model was fitted on two years of observation data. The applications were: (1) production of time series of daily runoff discharges from observed or simulated daily rainfall data, and (2) estimation of flood discharges from data due to exceptional meteorological events (operating time interval of an hour). In the model, the separation between the production function and the transfer function makes its utilization in different climatic zones and its transposition from one basin to another in the same hydrological region easier. (See also W77-10419) (Humphreys-ISWS)
W77-10424

A NEW METHOD FOR MODELLING MONTHLY DISCHARGE SERIES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W77-10425

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W77-10426

SIMULATION OF THE HYDROLOGICAL CYCLE OVER THE TISZA VALLEY USING ATMOSPHERIC WATER VAPOUR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
P. Magyar.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 149-153, 1975. 1 fig, 3 ref.

Descriptors: *Hydrologic cycle, *Mathematical studies, *Model studies, *Watersheds(Basins), Mathematical models, Hydrology, Evapotranspiration, Water vapor, Precipitable water, Meteorology, Analytical techniques, Analysis, Water storage, Foreign research, Foreign countries, Underground storage, Time series analysis.
Identifiers: *Hungary, *Tisza Valley(Hungary), Surface storage.

Simulation of the combined atmospheric and terrestrial hydrological cycle, the so-caled hydrometeorological approach, consists of mathematical processes used to extract the maximum amount of information from meteorological observations describing the movement of water vapour in the air, in order to solve hydrological problems on the ground. Input for the model consists of (1) precipitable water content, (2) moisture flux of the air, (3) precipitation, and (4) runoff of the specific area. The result is the output of time series of evaportranpiration and surface plus subsurface storage values. The same type of simulation was performed in 1973-1974 to determine the abovementioned missing hydrological components for the valley of the Tisza River. The following conclusions were reached: (1) No systematic error was detected in the time series of the precipitable water content of the air. (2) The time series of water vapour flux was found to be quite unstable. Systematic errors were eliminated by a three-step adjustment procedure consisting of the adjustment of means, variances, and insignificant noises. (3) The calculated change in land storage and evapotranspiration time series were checked by data obtained by the Thornthwaite method for the calculation of actual evapotranspiration and the stored amount of water for discrete points of the area. Differences were considerable. In general, compared with the values obtained by the Thornthwaite method, summer maximums were lower and winter maximums higher for evapotranspiration and the reverse for storage. (See also W77-10419) (Humphreys-ISWS)
W77-10427

A HYDROLOGICAL MODEL WITH PHYSICALLY REALISTIC PARAMETERS,
Severn-Trent Water Authority, Birmingham (England).
R. E. Manley.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 154-161, 1975. 3 fig, 1 tab, 7 ref.

Descriptors: *Model studies, *Runoff, *Watersheds(Basins), *Mathematical models, Hydrology, Soil water, Hydrologic cycle, Precipitation(Atmospheric), Groundwater, Water storage, Discharge(Water), Computer programs, Evapotranspiration, Analytical techniques, Analysis, Surface waters, Hydrographs.
Identifiers: *United Kingdom.

The reasons were examined for the use of physically realistic parameters in mathematical hydrological models. The parameters include the ability to use data on catchment shape, soil type, and channel dimensions in addition to meteorological and flow data. A model was described which is based on such parameters. The soil component of the model has reservoirs representing upper and lower soil horizons. In these horizons, capillary suction, effective permeability, and moisture content are simulated and are used to calculate the transfer of moisture in the soil and percolation to groundwater. The model employs a kinematic routing method for flow in channels. Model output consists of a printout of daily mean and maximum simulated flows and, optionally, daily groundwater level and hourly flows. The presented model results verified that the model has been applied satisfactorily to a number of catchments in England. (See also W77-10419) (Humphreys-ISWS)
W77-10428

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.

For primary bibliographic entry see Field 2F.
W77-10429

MATHEMATICAL SIMULATION MODELS OF HYDROLOGICAL PROCESSES IN TURKEY,
Aegean Univ., Bornova (Turkey). Faculty of Engineering Sciences.
U. Ozis.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 185-191, 1975. 1 fig, 38 ref.

Descriptors: *Model studies, *Hydrologic aspects, *Watersheds(Basins), *Hydrology, Foreign countries, Foreign research, Reviews, Groundwater, Water levels, Karst hydrology, Streamflow, Statistical methods, Annual, Monthly.
Identifiers: *Turkey.

The application of mathematical simulation models and experimental statistical methods are of great importance, especially for countries where records of hydrological processes are of relatively short duration and only a minor part of the available water resources have actually been developed. Turkey is a country where the longest streamflow record covers a period of less than 40 years, the bulk of hydrometric and meteorological stations have been set up after 1960, and only 10-20% of the water resources have been developed. Mathematical Simulation models increasingly have been applied to hydrological processes in Turkey during recent years. The analysis of the work achieved has revealed that two subjects in particular have attracted much interest in Turkey. The first is the Firat (Euphrates) basin, which represents almost 1/6 of the water supply and 1/3 of the water power potential; the second is the karstic basins, which cover almost all the southern half of Turkey. This paper reviewed and briefly summarized studies of annual streamflow series, annual hydroelectric energy series, monthly streamflow series, monthly spring discharges, monthly groundwater levels, and daily hydrologic processes. (See also W77-10419) (Humphreys-ISWS)
W77-10430

STOCHASTIC IDENTIFICATION OF NON-LINEAR HYDROLOGICAL SYSTEMS,
Pittsburg Univ., Pa. Dept. of Civil and Environmental Engineering.
R. G. Quimpo.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 192-197, 1975. 2 fig, 9 ref. NSF GK 20388 A 2.

Descriptors: *Hydrologic systems, *Model studies, *Stochastic processes, *Hydrograph analysis, Statistical methods, Correlation analysis, Mathematical analysis, Daily hydrographs, Hydrology, Analytical techniques, Analysis, Input-output analysis.
Identifiers: Kernels.

The use of higher order cross-correlation techniques in the identification of a nonlinear hydrological system was developed. The nonlinear model adopted is the functional series representation whose deterministic identification has been previously developed by others using either the orthogonal expansion method or a least-square optimization procedure. The stochastic method presented complements the mentioned two deterministic techniques. An inflow-outflow example was worked out to illustrate the determination of the first and second order kernels of the nonlinear system model. It was concluded that the stochastic identification of the nonlinear kernel using the developed approach is feasible. Once the procedures are generalized to remove some of the restrictions imposed, the technique promises to be a powerful tool in nonlinear modelling to complement existing deterministic methods. (See also W77-10419) (Humphreys-ISWS)
W77-10431

A MODEL OF THE MELTING PROCESS OF THE SNOW COVER AS A PART OF CATCHMENT MODELS,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Berlin. Forschungsinstitut fuer Hydrometeorologie.
For primary bibliographic entry see Field 2C.
W77-10432

STATISTICAL MODELLING OF RIVER FLOW BY THE MONTE CARLO METHOD AND EVALUATION OF DISTRIBUTION PARAMETERS AND QUANTITIES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10433

A MATHEMATICAL MODEL FOR URBAN RUNOFF,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
E. J. Sarginson, and B. B. Nussey.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 209-213, 1975. 3 fig, 1 tab, 6 ref.

Descriptors: *Urban runoff, *Mathematical models, *Rainfall-runoff relationships, Runoff, Discharge(Water), Storm runoff, Hydrographs, Model studies, Surface runoff, Runoff forecasting, Runoff coefficient, Rational formula, Analytical techniques, Foreign research, Foreign countries.
Identifiers: *United Kingdom.

In developing a mathematical 'model' relating rainfall and runoff in urban areas, the following principles were important: it should attempt to reproduce the mechanics of urban runoff, it should consistently predict discharges accurately, and it should be relatively simple to apply in practice to design problems. The model reported herein assumes that after deducting lossses for surface depression and infiltration, the excess rainfall from the whole catchment is routed successively overland and through the pipe system. The process is equivalent to flow through two equal linear reservoirs in series and leads to a linear second-order differential equation. The total rainfall loss during a storm is a linear function of the total rainfall and the slope and impermeability of the catchment. In combination with a standard design storm such as the one suggested by the Meteorological Office of the United Kingdom, the 'model' results in a simple formula for the discharbe, incorporating 'reduction factors' which depend on the rainfall loss coefficient and the linear pipe routing parameter, which can be computed from the dimensions of the pipe system. A statistical analysis of existing data showed a linear correlation between the percentage runoff and the catchment slope and leads to a modification of the 'rational' formula, which incorporates this correlation. (See also W77-10419) (Humphreys-ISWS)
W77-10434

CHARACTERISTICS OF RAINFALL CELL PATTERNS IN THE SOUTHEAST COASTAL PLAIN AREAS OF THE USA, AND A COMPUTER SIMULATION MODEL OF THUNDERSTORM RAINFALL,
Middle East Technical Univ. Ankara (Turkey).
For primary bibliographic entry see Field 2B.
W77-10435

STOCHASTIC PROPERTIES OF THE PROCESSES TRANSFORMED IN LINEAR HYDROLOGICAL SYSTEMS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
W. G. Strupczewski, R. J. Kiczko, Z. W. Kundzewicz, J. J. Napiorkowski, and H. T. Mitosek.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 231-237, 1975. 1 tab, 6 ref.

Descriptors: *Hydrologic systems, *Model studies, *River systems, *Synthetic hydrology, Watersheds(Basins), Stochastic processes, Mathematical models, Hydrology, Hydrologic aspects, Statistical methods, Input-output analysis, Markov processes, Analytical techniques, Correlation analysis.
Identifiers: Muskingum model, Nash model, Linear analysis.

The transformation of white noise and the Markov process through the linear, time invariant river system was examined. The systems presented correspond to the linear reservoir model, the Nash model, the Muskingum model, and two linear river system models with common input. Normalized functions of auto- and cross-correlation were presented. The time series obtained by integration of the output process were also considered. The results obtained would be difficult to obtain experimentally because of the fact that the models approximate actual nonlinear hydrological systems and also that hydrometeorological measurement devices add some error to the actual signal in the form of additional noise. Since the conceptual linear hydrological models are widely used, the analysis of some stochastic properties may seem useful for practical applications. (See also W77-10419) (Humphreys-ISWS
W77-10436

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
J. Urban, J. Novak, and J. Stransky.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 247-256, 1975. 4 fig, 4 ref.

Descriptors: *Model studies, *Rainfall-runoff relationships, *Watersheds(Basins), *Computer models, Computer programs, Unit hydrographs, Runoff, Rainfall, Rainfall disposition, Hydrographs, Hydrologic aspects, Hydrology, Input-output analysis, Discharge(Water), Streamflow forecasting, Foreign research, Depth-area curves.

The program of the complex solution consists of two parts. The first part includes the evaluation of rainfall data from individual stations, determination of the direct runoff and effective rainfall, computation of parameters and instantaneous unit hydrograph for the selected model and criteria of coincidence between the observed and regenerated hydrographs. The second part of the program enables the runoff hydrograph to be predicted from the given rainfall data. The program has a structure in which the main program MASTER SEGMENT controls individual blocks solving corresponding basic problems. Each of these problems may be solved separately, either with the data obtained from the previous blocks or with any other data given as the input. The program is written in 1900 FORTRAN for ICL 1900 and ODRA 1300 computers. (See also W77-10419) (Humphreys-ISWS)
W77-10437

A MATHEMATICAL MODEL OF FLOOD WAVES MOVING ALONG A CASCADE OF RESERVOIRS ON A LARGE RIVER,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 2E.
W77-10438

STRUCTURE OF NATURAL HYDROLOGIC TIME PROCESSES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 2; Colorado State University, Fort Collins, p 2-1 -- 2-59, 1976. 29 fig, 10 ref.

Descriptors: *Water resources, *Stochastic processes, *Mathematical studies, *Hydrologic systems, Theoretical analysis, Mathematical models, Statistical methods, Equations, Time series analysis, Analytical techniques, Hydrology, Runoff, Streamflow, Precipitation(Atmospheric), Frequency, Correlation analysis, Variability, Solar radiation, Probability, Water temperature.
Identifiers: Correlograms, Stationarity.

Natural hydrologic time processes are defined as time series of various hydrologic variables of all three types of variables of a natural water resources system, namely of inputs, states-of-the-system, and outputs. The term 'natural' implies that in observing those time processes in the form of samples of given sizes, they have no significant systematic errors (inconsistency in data), no large random measurement errors (small random measurment errors are unavoidable), and no significant man-made or natural accidental changes (nonhomogeneity in data). When inconsistency and nonhomogeneity do exist ad are proven, their proper removal would reduce the observed samples to samples of natural time processes. The inputs to man-made water resources systems, or to combined natural and man-made systems, are most often in the form of natural hydrologic time processes. This chapter dealt only with the structure of consistent, homogeneous natural time processes, or with samples reduced to such processes. (See also W77-10439) (Humphreys-ISWS)
W77-10440

GENERATION OF HYDROLOGIC AND WATER RESOURCES SAMPLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 4; Colorado State University, Fort Collins, p 4-1 -- 4-41, 1976. 21 fig, 7 tab, 11 ref.

Descriptors: *Water resources, *Stochastic processes, *Synthetic hydrology, *Statistical methods, *Great Lakes, Statistics, Hydrologic data, Sampling, Hydrologic systems, Hydrologic aspects, Hydrology, Mathematical studies, Time series analysis, Variability, Parametric hydrology, Frequency, Correlation analysis, Mathematical models, Model studies, Analytical techniques, Data processing.
Identifiers: Sample generation, Correlograms, Random numbers, Hydrologic processes.

The generation of new samples of stochastic processes in hydrology and water resources was analyzed by a study of individual series (univariate time processes) or a study of a set of point series (multivariate time processes), or a set of interrelated variables (also multivariate time processes). It is easy to reduce a multivariate time process to a univariate process, so the discussion started with the general discussion of generating samples of a set of station series. The monthly and quarter-monthly net basin supplies for the system for Great Lakes in the United States and Canada were used to demonstrate the techniques of generating the new samples of hydrologic data Basically, all information available, statistical of the historic data and physical (or otherwise), should be used to obtained the best inference about the population process. it is understood that the ture population of hydrologic processes are never known. When the new samples are generated, the tests should be designed to show that both the historic and the generated samples are from the same, unknown population approximated by the inferred population model. (See also W77-10439) (Humphrey-ISWS)
W77-10441

DATA COLLECTION, ANALYSIS AND INSTRUMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
W. Z. Sadeh.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 5; Colorado State Univ., Fort Collins, p 5-1 -- 5-27, 1976. 4 fig, 52 ref.

Descriptors: *Water resources, *Hydrologic data, *Sampling, *Data processing, *Stochastic processes, Statistics, Statistical methods, Probability, Analytical techniques, Mathematical studies, Variability, Correlation analysis, Frequency, Estimating, Instrumentation.
Identifiers: *Random data, Hydrologic processes.

Acquisition and processing of random data to a large extent depends on the physical process being investigated and on the specific aims of the study. The procedure involves five main phases: (1) data collection; (2) data recording; (3) data preparation; (4) data qualification; and (5) data analysis. The five primary steps, including the sequential stages of each category, were illustrated. (See also W77-10439) (Humphreys-ISWS)
W77-10442

LONG-RANGE CHANGES,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
W. Q. Chin, and V. Yevjevich.
In: Stochastic Approaches to Water Resources, Volume I, Chapter 6; Colorado State University, Fort Collins, p 6-1 - 6-45, 1976. 18 fig, 40 ref.

Descriptors: *Paleoclimatology, *Reviews, *Dendrochronology, *Stochastic processes, Dating, Climatology, Climates, Geologic time, Paleohydrology, History, Analytical techniques, Model studies, Borehole geophysics, Core logging, Sediments, Ice, Sampling, Pleistocene epoch, Solar radiation.
Identifiers: Long term changes, Historical climate.

Hydrologic processes are intimately related to climate. Climatic fluctuations are manifested as droughts, floods, advance or retreat of glaciers, and other changes in various geophysical phenomena. The main concern of this chapter, however, is with long-range changes of the climate as a result of natural causes. There is ample evidence that remarkable fluctuations of the climate have occurred during the earth's history. The changes have different characteristics, depending on whether our interest is with time spans of decades, centuries, millennia, or hundreds of millions of years. The climate of the earth has varied from warm or hot tropical regimes to ice ages with various degrees of changes between these extremes. A brief overview of long-range climate changes was presented. Concepts and techniques used in developing deterministic-stochastic models for evaluating climatic change based on the proxy records from deep-sea sediment cores and the ice core of the Greenland ice sheet were discussed. (See also W77-10439) (Humphreys-ISWS)
W77-10443

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10552

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10553

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10554

GEOLOGICAL SURVEY RESEARCH 1976.
Geological Survey, Reston, Va.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $5.50. Professional Paper 1000, 1976. 414 p, 10 fig, 4 tab, 581 ref.

Descriptors: *Natural resources, *Programs, *Projects, *Water resources, *Geologic investigations, Mineralogy, Water analysis, Analytical techniques, Land use, Mapping, Data collections, Geothermal studies, Oil, Coals, Remote sensing, Satellites(Artificial), Evaluation, Geological Survey.

This U.S. Geological Survey activities report includes a summary of recent (1976 fiscal year) scientific and economic results accompanied by a list of geologic and hydrologic investigations in progress and a report on the status of topographic mapping. The summary of results includes: (1) Mineral resources, Water resources, (2) Engineering geology and hydrology, (3) Regional geology, (4) Principles and processes, (5) Laboratory and field methods, (6) Topographic surveys and mapping, (7) Management of resources on public lands, (8) Land information and analysis, and (9) Investigations in other countries. Also included are lists of cooperating agencies and Geological Survey offices. (Woodard-USGS)
W77-10560

HYDROLOGIC EVALUATION OF ASHLEY VALLEY, NORTHERN UINTA BASIN AREA, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
J. W. Hood.
Utah Department of Natural Resources Technical Publication No 54, 1977. 25 p, 3 fig, 1 plate, 6 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Irrigation effects, Surface-groundwater relationships, Water yield, Streamflow, Reservoirs, Aquifers, Hydrogeology, Water level fluctuations, Pumping, Groundwater recharge, Available water, *Ashley Valley(Utah), Northern Uinta Basin.

The water resources of the northern Uinta Basin, Utah and Colorado, were studied during 1971-74. Ashley Valley was evaluated in slightly greater detail than the general area, in order to assess the

general relation of ground- and surface-water supplies. In Ashley Valley, the principal source of both irrigation supply and ground-water recharge is the flow from Ashley Creek canyon. Groundwater recharge to the valley fill, however, is mainly from canal and field losses along the west side of the valley. The permeability of the fill in most places is high, and water-level records indicate rapid changes in storage in response to the annual applications of irrigation water. The amount of ground water available from storage in Ashley Valley is estimated to be 50,000-75,000 acre-feet, or enough water to supply irrigation in the vally for a maximum of 2 years. The water from Ashley Creek canyon is fresh. Mixing of snowmelt and base flow in Steinaker Reservoir yields a water of more uniform quality; but despite some concentration by evaporation from the reservoir, the outflow from the reservoir is fresh. Ground water in most of the valley is fresh, but the water increases in dissolved-solids concentration toward the south and east. (Woodard-USGS)
W77-10564

INDEX OF PUBLISHED SURFACE-WATER-QUALITY DATA FOR OKLAHOMA 1946-1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-10567

WATER-RESOURCES INVESTIGATIONS IN MONTANA, 1976.
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-10573

WATER-RESOURCES INVESTIGATIONS IN OKLAHOMA, 1976.
Geological Survey, Oklahoma City, Okla. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-10574

WATER-RESOURCES INVESTIGATIONS IN WYOMING, 1976.
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-10575

A PROCEDURE FOR THE SELECTION OF OBJECTIVE FUNCTIONS FOR HYDROLOGIC SIMULATION MODELS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10767

SOME REMARKS ON THE STATISTICAL THEORY OF EXTREME VALUES,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
P. Todorovic, and H. W. Shen.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 14, Colorado State University, Fort Collins, p 14-1 - 14-31, 1976. 8 fig, 10 ref.

Descriptors: Water resources, *Stochastic processes, *Model studies, *Reviews, Theoretical analysis, Statistical methods, Mathematical studies, Mathematics, Mathematical models, Probability, Analytical techniques, Equations, Hydrology, Floods, Droughts, Precipitation(Atmospheric).
Identifiers: *Extreme values, Stationarity.

The statistical theory of extreme values had its beginning shortly after the turn of the eighteenth century. The oldest problems that eventually might lead to a theory of extreme values are some hydrological phenomena, such as floods, droughts, precipitation, etc., whose importance have been recognized since ancient times. Frequently, however, the structure of the phenomena is so complex that an application of the existing stochastic models is not feasible. This is one of the reasons why engineers are inclined to use some other methods in analysis of extreme values of various hydrologic and geophysical phenomena, rather than those available in probability theory. In this paper, the authors attempted to review and summarize in an integrated form some theoretical results in the statistical theory of extreme values which have potential applicability to various water resources problems. Subjects presented included stochastic structures, extreme values, location of extremes, some joint distributions, extreme terms in a sequence of a random number of random variables, and the time when extremes are achieved. (See also W77-10439) (Humphreys-ISWS)
W77-10786

STOCHASTIC STRUCTURES OF THE LOCAL PATTERN OF PRECIPITATION,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2B.
W77-10787

FLOODS AND DROUGHTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10788

STATISTICAL APPLICATIONS IN GROUNDWATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-10789

WATERSHED SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 4D.
W77-10790

MODELING OF STREAM GEOMETRY AND ITS APPLICATIONS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10791

STOCHASTIC ASPECTS OF INCIPIENT GRAIN MOTION ON RIVERBEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10792

SEDIMENT TRANSPORT MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 2J.
W77-10793

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W77-10794

DISPERSION OF SEDIMENT PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10795

2B. Precipitation

SEASONAL OCEANIC PRECIPITATION FREQUENCIES FROM NIMBUS 5 MICROWAVE DATA,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
S. Q. Kidder, and T. H. Vonder Haar.
Journal of Geophysical Research, Vol. 82, No. 15, p 2083-2086, May 20, 1977. 7 fig, 1 tab, 22 ref. NASA NGR-06-002-102.

Descriptors: *Remote sensing, *Precipitation(Atmospheric), *Rainfall, *Tropical regions, Seasonal, Satellites(Artificial), Oceans, Clouds, Microwaves, Frequency, Frequency analysis, Temperature, Measurement, Data processing, Meteorology.
Identifiers: *Nimbus 5, Microwave precipitation measurement, ESMR data, Radiometers.

Microwave brightness temperature data from the Nimbus 5 satellite were analyzed by using threshold brightness temperatures to yield tropical oceanic precipitation frequencies for several classes of rainfall rates during the season December 1972 through February 1973. Data taken near local noon and near local midnight were analyzed. The overall results were consistent with both climatological precipitation frequency and with concurrent satellite-derived frequency of highly reflective clouds. The difference between the local noon and the local midnight frequency is small, but the heavier rainfall rates tend to occur more frequently near local noon. The ratios of the frequencies of light, moderate, and heavy rain were observed to be relatively constant over the tropical oceans. Passive microwave measurements from space seem to be an important step toward accurate measurement of oceanic precipitation. (Sims-ISWS)
W77-10105

DETERMINATION OF RAINFALL DISTRIBUTIONS FROM MICROWAVE RADIATION MEASURED BY THE NIMBUS 6 ESMR,
Wisconsin Univ.-Madison. Dept. of Meteorology.
J. A. Weinman, and P. J. Guetter.
Journal of Applied Meteorology, Vol. 16, No. 4, p 437-442, April 1977. 3 fig, 5 tab, 7 ref, 1 append. NSF ATM75-21117.

Descriptors: *Remote sensing, *Rainfall, *Microwaves, Satellites(Artificial), Radiation, Clouds, Analytical techniques, Data processing, Mathematical models, Measurement, Meteorology.
Identifiers: *Polarized radiation, Nimbus, ESMR measurements.

The polarization of 37 GHz microwave radiances emerging from rain clouds above land and rough and calm water surfaces was computed from the equation of radiative transfer. Scattering was assumed to be characterized by a Rayleigh phase matrix. The radiative transfer equation was solved by means of a Neumann solution. It was found that the brightness temperatures of the upward directed radiances emerging from rain clouds were relatively independent of polarization. The weak polarization of radiation emitted by rain clouds can be used to discriminate between cool brightness temperatures emerging from rain clouds and from open water. The brightness temperatures of radiances emerging from rain clouds over water can be transformed into a single-valued function of the rainfall rate if polarization effects are considered. A sample of Nimbus 6 data was analyzed in accord with the results of the theoretical analysis. (Sims-ISWS)
W77-10106

PERSISTENCE, RUNS AND RECURRENCE OF PRECIPITATION,
Air Force Geophysics Lab., Hanscom AFB, Mass.
I. A. Lund, and D. D. Grantham.
Journal of Applied Meteorology, Vol. 16, No. 4, p 346-358, April 1977. 10 fig, 16 tab, 6 ref.

Descriptors: *Precipitation(Atmospheric), *Probability, *Frequency, *Northeast U.S., *Southeast U.S., Data processing, Analytical techniques, Model studies, Mathematical models, Persistence, Variability, Rainfall, Snowfall, Seasonal, Climatology, Meteorology.
Identifiers: Duration, Recurrence.

A total of 511,056 hourly observations of precipitation, taken over a 13-year period at nine stations, was studied to obtain a better understanding of the characteristics of persistence, runs, and recurrence. Each hourly precipitation observation was categorized as either none, light, moderate, or heavy. Probabilities of each category, except heavy, were estimated from relative frequencies determined from the large data sample and were compared with some theoretical models. The heavy category occurred too infrequently at all of the nine stations to obtain statistically stable relative frequencies from a 13-year period of record. The sample provided sufficient information about the other categories to confidently fit models to the data. The models can be applied to estimate probabilities that precipitation will be observed for sequences of x hours, or more; for exactly x hours; or at time t and also at time t + x hours. (Sims-ISWS)
W77-10110

A FIELD EXPERIMENT ON THE CALIBRATION OF RADARS WITH RAINDROP DISDROMETERS,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
B. E. Martner.
Journal of Applied Meteorology, Vol. 16, No. 4, p 451-454, April 1977. 3 fig, 5 ref. NOAA 03-5-022-6.

Descriptors: *Radars, *Rainfall, *Oklahoma, *Raindrops, Measurement, Precipitation(Atmospheric), Thunderstorms, Hail, Remote sensing, Rain gages, Meteorology.
Identifiers: *Disdrometers, *Drop spectra, Radar reflectivity.

Radar reflectivity factors determined from disdrometer measurements of drop spectra were compared with simultaneous WSR-57 radar measurements in two Oklahoma thunderstorms. The possibility of using a disdrometer for an in-field calibration check of a radar was examined and found to have limited usefulness for convective precipitation sampled at long ranges. (Sims-ISWS)
W77-10112

A SATELLITE TECHNIQUE FOR QUANTITATIVELY MAPPING RAINFALL RATES OVER THE OCEANS,
National Aeronautics and Space Adminstration, Greenbelt, Md. Goddard Space Flight Center.
T. T. Wilheit, A. T. C. Chang, M. S. V. Rao, E. B. Rodgers, and J. S. Theon.
Journal of Applied Meteorology, Vol. 16, No. 5, p 551-560, May 1977. 9 fig, 2 tab, 31 ref.

Descriptors: *Remote sensing, *Rainfall, *Oceans, *Mapping, Microwaves, Satellites(Artificial), Clouds, Radar, Measurement, Meteorology.
Identifiers: *ESMR data, Radiometers, Nimbus, Brightness temperature.

A theoretical model for calculating microwave radiative transfer in raining atmospheres was developed. The calculations were compared with microwave brightness temperatures at a wavelength of 1.55 cm measured by the Electrically Scanning Microwave Radiometer (ESMR) on the Nimbus 5 satellite and with rain rates derived from WSR-57 meteorological radar measurements. A specially designed ground-based verificaton experiment also was performed, wherein upward viewing microwave brightness temperature measurements at wavelengths of 1.55 and 0.81 cm were compared with directly measured rain rates. It was shown that over ocean areas, brightness temperature measurements from ESMR may be interpretated in terms of rain rate with about an accuracy of a factor of 2 over the range 1-25 mm/h rain rate. (Sims-ISWS)
W77-10113

SETTLING VELOCITIES OF SMALL ICE CRYSTALS,
Ben Gurion Univ. of the Negev, Beer Sheva (Israel). Research and Development Authority.
G. Michaeli.
Tellus, Vol 29, No 3, p 282-285, June 1977. 1 fig, 1 tab, 11 ref.

Descriptors: *Crystals, *Ice, *Settling velocity, Laboratory tests, Cloud physics, Velocity, Data processing, Theoretical analysis, Meteorology.
Identifiers: *Ice crystals.

Settling velocities, masses and external dimensions were determined experimentally for small freely falling ice crystals grown for about 100 s at 12 different temperatures within the range -3.4 to -20 C. The corresponding terminal velocities were calculated using the above measurements, together with the empirical Be-Re relationships, deduced from previous model experiments. Reasonably good agreement was found between theory and experiment. (Sims-ISWS)
W77-10121

CLOUD CONDENSATION NUCLEUS SIZE DISTRIBUTIONS AND THEIR EFFECTS ON CLOUD DROPLET SIZE DISTRIBUTIONS,
Naval Weapons Center, China Lake, Calif. Research Dept.
E. E. Hindman, II, P. V. Hobbs, and L. F. Radke.
Journal of the Atmospheric Sciences, Vol 34, No 6, p 951-956, June 1977. 3 fig, 1 tab, 20 ref, 1 append.

Descriptors: *Nucleation, *Drops(Fluids), *Raindrops, *Washington, Cloud physics, Chemistry of precipitation, Condensation, Crystal growth, Crystallization, Precipitation(Atmospheric), Rain, Clouds, Particle size, Meteorology.
Identifiers: *Condensation nuclei, Size distributions, Cloud droplets.

Cloud droplet size distributions, calculated from cloud condensation nucleus (CCN) measurements made beneath non-raining, warm clouds in western and eastern Washington State, show reasonable agreement with droplet size distributions measured in the clouds. The results of both the measurements and the calculations showed that high concentrations of large (D between 0.2 and 2 micrometers) and giant (D greater than 2 micrometers) CCN lead to droplet size distributions, which contain large droplets (D greater than 30 micrometers) only if low concentrations of small (D between 0.06 and 0.2 micrometers) CCN are present. If high concentrations of small CCN are present, the droplet size distributions contain few, if any, large droplets, regardless of the concentrations of giant CCN. (Sims-ISWS)
W77-10125

ISOTOPIC, CRYSTAL AND AIR BUBBLE STRUCTURES OF HAILSTONES,
National Center for Atmospheric Research, Boulder, Colo.
W. C. Macklin, C. A. Knight, H. E. Moore, N. C. Knight, and W. H. Pollock.
Journal of the Atmospheric Sciences, Vol 34, No 6, p 961-967, June 1977. 2 fig, 1 tab, 20 ref.

Descriptors: *Hail, *Thunderstorms, *Crystals, Temperature, Crystallization, Ice, Deuterium, Bubbles, Laboratory tests, Precipitation(Atmospheric), Cloud physics, Heat balance, Meteorology.
Identifiers: *Hailstones, Hailstone growth, Air bubbles, Crystal structure.

The deuterium, crystal, and air bubble structures of 11 large hailstones from three severe storms were examined. It was emphasized that there are a number of assumptions underlying the interpretation of such data, and the assumptions were discussed. In seven of the hailstones, the ambient temperatures at which they grew were inferred from the crystal size. The deuterium concentrations and ambient temperatures generally showed similar variations, and the crystal data thereby provided a useful way of placing an absolute temperature scale against the deuterium values. Throughout most of their growth, the hailstones grew in the updraft between about the ambient temperature levels of -17 to -30C. The air bubble analyses showed that the transparent layers in the hailstones were formed in the wet growth regime, while the opaque layers were formed near the wet growth limit. On this basis, calculations of the effective liquid water concentrations EW give values of 2-3 g/cu m. On the assumption that the median volume radius of the cloud droplets is 10 micrometers, the actual liquid water concentrations are then about 4 to 5.5 g/cu m. (Sims-ISWS)
W77-10126

EFFECTS OF ACID PRECIPITATION ON A SMALL ACID LAKE IN SOUTHERN NORWAY,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-10127

THE EFFECT OF MODEL GRID LENGTH AND OROGRAPHIC RAINFALL 'EFFICIENCY' ON COMPUTED SURFACE RAINFALL,
Radar Establishment, Malvern (England), Meteorological Office Research Unit.
C. G. Collier.
Quarterly Journal of the Royal Meteorological Society, Vol 103, No 436, p 247-253, April 1977. 2 fig, 8 ref.

Descriptors: *Model studies, *Orography, *Rainfall, Numerical analysis, Cloud physics, Mountains, Clouds, Efficiencies, Foreign countries, Foreign research.
Identifiers: *Grid length, *Orographic rainfall, *Wales, Numerical parameterization model, Areal rainfall, Orographic enhancement.

Surface rainfall distributions over North and South Wales were derived using a numerical parameterization model. Several different grid lengths were used, which allowed the dependence on grid length of areal rainfall produced by the model to be examined. It was found that as the grid length increased from one to ten km, areal rainfall totals predicted by the model decreased, in some cases quite rapidly. The areal rainfall totals also depended upon the amount of orographic enhancement operating in particular cases owing to cloud physics processes which were not parameterized in the model. A suggestion was offered as to how the processes can be taken into account in the model. (Roberts-ISWS)
W77-10133

AN INVESTIGATION OF THE PARTICULATE PHASE OF ACID PRECIPITATION,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
J. E. Ganjei, and G. H. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 615, Price codes: A02 in paper copy, A01 in microfiche.
Completion Report, June 1977. 10 p, 5 fig, 2 tab, 3 ref. OWRT A-066-NY(1). 14-34-0001-6033.

Descriptors: *Environmental control, Effects, Feasibility, Microscopy, Precipitation(Atmospheric), Ions, Pollutant identification.
Identifiers: *Acid rain, Particulates, *Light microscopy, *Ion microprobe, Sensitivity, Qualitative analysis.

Acid rain has been recognized as an important environmental problem. Many researchers are currently working on the different aspects of the problem such as sources, geographical and seasonal monitoring and ecological effects. This project studied the feasibility of using the light microscope and ion microprobes for rain particulate analysis (> 0.5 micrometers). The light microscope was very good for qualitative analysis (types of particles) but generally unrealiable for quantitative determinations. The ion microprobe had the sensitivity to detect minor elements within small particles but the lack of appropriate standards prevented quantitative analyses.
W77-10178

STOCHASTIC MODELS FOR PRECIPITATION,
Kentucky Water Resources Research Inst., Lexington.
P. Purdue, and Z. Govindarajulu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 647, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 105, June 1977. 49 p, 32 tab, 12 ref. OWRT A-055-KY(2), 14-31-0001-5017, 14-34-0001-6018.

Descriptors: Precipitation(Atmospheric), *Model studies, *Markov processes, *Kentucky, *Simulation analysis, *Rainfall disposition, *Stochastic processes, *Simulated rainfall.
Identifiers: *Semi-Markov processes.

A stochastic model, using Semi-Markov processes, was developed to simulate daily rainfall patterns in Kentucky. This model contains many of the currently used models as special cases and is applicable at any station in Kentucky as well as elsewhere. For use in Kentucky an 8 state Semi-Markov process is developed and the parameters of the model are determined from historical rainfall data. The model is tested at 4 different stations in Kentucky and the simulated and actual rainfall processes are found to be in good agreement. Finally some long run probabilities are calculated as well as mean return times. An appendix outlining some basic properties of the Semi-Markov process is also included. (Huffsey-Kentucky)
W77-10180

WINTER AND SUMMER INSOLATION PATTERNS FOR SOUTHERN AFRICA,
Natal Univ., Pietermaritzburg (South S Africa). Dept. of Agricultural Engineering.
R. E. Schulze, and O. S. McGee.
South African Journal of Science, Vol. 72, p 182-183, June 1976. 9 ref, diagrams.

Descriptors: *Energy, *Solar radiation, Sunlight, Spatial distribution, Cloud cover, Fog, Coasts, *Winter, Wet seasons, Weather forecasting, Geographical regions, Climatology, Meteorology, Africa, *Summer.
Identifiers: South Africa, Rhodesia, Zambia, Angola, Botswana, Zaire, Malawi, South West Africa, *Africa(Southern).

Updated seasonal solar radiation maps have been drawn for Southern Africa, using the latest readily available radiation data from 46 existing and newly-established stations on the subcontinent. Major radiation patterns as described by Drummond and Vowinckel (1957) persist in the present study, although the latitudinal evidence is more strongly evident in the revised maps. (So African Water Info Center)
W77-10195

EXPECTED FUTURE RAINFALL OVER SELECTED PARTS OF SOUTH AFRICA,
University of the Witwatersrand Univ., Johannesburg (South Africa). Dept. of Geography and Environmental Science.
T. G. Dyer.
South African Journal of Science, Vol. 72, No. 8 p 237-239, August 1976. 9 fig, map, 5 ref.

Descriptors: *Weather patterns, *Weather forecasting, Droughts, Climatic zones, Climatic data, *Rainfall, Temporal distribution, Seasonal, Stochastic hydrology, Precipitation(Atmospheric), Wet seasons, Weather data, Climatology.
Identifiers: South Africa, Transvaal, Karoo.

It appears that estimation of future spells of wet and dry years is possible, based on the assmption that the general circulation over South Africa and the surrounding oceans will be similar to the pattern of the past sixty years. A subjective forecasting technique, and one based on trigonometric regression tend to indicate that the present wet period has probably reached its peak in the summer rainfall area. Years to serious drought in the 1980's are predicted. A method based on sunspots predicts later-occurring fluctuations of the same order. (So African Water Info Center)
W77-10198

ANNUAL RAINFALL FREQUENCY DISTRIBUTIONS FOR 80 RAINFALL DISTRICTS IN SOUTH AFRICA,
South Africa Univ., Pretoria (South Africa).
P. A. Onesta, and P. Verhoef.
South African Journal of Science, Vol. 72, No. 4, p 120-122, April 1976. 2 fig, 3 tab, 6 ref.

Descriptors: *Rainfall, Dispersion, Skewness, Distribution, *Distribution patterns, Geographical regions, Precipitation(Atmospheric), *Rainfall disposition.
Identifiers: *South Africa.

South Africa has been classified into various rainfall districts at different times. The classifications of Schumann and Hofmeyr (1960) and van Van Rooy (1972) are discussed on the basis of precipitation frequency distribution. The coefficient of variation of rainfall varies from between 15 and 20% in the east of the country to over 30% in the Karoo and Northern Cape. (So African Water Info Center)
W77-10206

THE USE OF MATHEMATICAL MODELS FOR FORECASTING IN HYDROLOGY AND METEOROLOGY,
Electricite de France, Grenoble. General Technical Div.
For primary bibliographic entry see Field 2A.
W77-10298

CLOUD SEEDING EXPERIMENTAL PROGRAM IN RHODESIA: 1974-75,
Meteorological Service, Salisbury (Rhodesia).
For primary bibliographic entry see Field 3B.
W77-10306

MELTING RATES OF VARIOUS SIZE HAILSTONES IN A LARGE VERTICAL WIND TUNNEL,
State Univ. of New York at Albany. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W77-10307

COLLECTION KERNELS FOR THE CAPTURE OF SILVER IODIDE NUCLEI BY CLOUD WATER DROPS,
Naval Weapons Center, China Lake, Calif. Earth and Planetary Sciences Div.
For primary bibliographic entry see Field 3B.
W77-10308

CHARACTERISTICS OF SILVER IODIDE ICE NUCLEI GENERATORS CURRENTLY USED BY SO.R.E.M.,
Societa' Richerche Esperienze Meteorologiche (Italy).
For primary bibliographic entry see Field 3B.
W77-10309

EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON LAMBDA = 2.1 CM,
For primary bibliographic entry see Field 7B.
W77-10322

GLOBAL MASS AND ENERGY REQUIREMENTS FOR GLACIAL OSCILLATIONS AND THEIR IMPLICATIONS FOR MEAN OCEAN TEMPERATURE OSCILLATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
B. Saltzman.
Tellus, Vol. 29, No. 3, p 205-212, June 1977. 3 fig, 12 ref. NSF ATM75-00351, ATM75-21814.

Descriptors: *Paleoclimatology, *Water temperature, *Glaciers, *Oceans, Water balance, Energy, Energy budget, Atmosphere, Ice, Water, Thermodynamics, Model studies, Mathematical models, Climatology, Meteorology, Glaciology.
Identifiers: *Ocean temperature.

Conservation equations for water in all forms and thermodynamic energy were developed for the complete atmosphere-hydrosphere-lithosphere-cryosphere system, allowing the possibility for temporal variations of all significant components of the system that may be involved in long term climate changes. Using the equations, an integral constraint on the fluctuations of the mean, mass-averaged, ocean temperature that accompany glacial fluctuations was found. Some possible inferences were discussed, based on speculations concerning the variations of the net radiative flux at the top of the atmosphere. For one plausible qualitative estimate of the processes involved, it was determined that the mean global ocean temperature should be increasing during the period of growth of ice coverage, reaching a maximum sometime after the time of maximum ice extent and a minimum sometime after the interglacial, a result that is in substantial accord with the ice-age mechanism discussed by Newell. (Sims-ISWS)
W77-10327

OROGRAPHIC RAINFALL IN WARM SECTORS OF DEPRESSIONS,
Meteorological Office, Bracknell, Berkshire (England).
M. J. Bader, and W. T. Roach.
Quarterly Journal of the Royal Meteorological Society, Vol. 103, No. 436, p 269-280, April 1977. 8 fig, 1 tab, 13 ref.

Descriptors: *Rainfall, *Orography, *Mathematical models, *Meteorology, Precipitation(Atmospheric), Theoretical analysis, Model studies, Cloud physics, Raindrops, Condensation, On-site investigations, Foreign countries, Foreign research, Topography, Washouts.
Identifiers: *Wales, *Treorchy(Wales).

Results of some calculators were presented which showed that the washout of droplets in a low-level, orographically produced cloud by raindrops falling from a higher-level cloud (formed by large-scale ascent) can augment the rainfall rate by several mm/h over a hill a few hundred meters high. The dependence of the enhancement upon different meteorological parameters was discussed, and calculated values were compared with some observed rainfall rates over south Wales. In the model, the lower orographic and upper rain-producing clouds were treated as separate entities, and the rainfall rate from the upper cloud, P, was assumed to be unaffected by the hill. It is probable, though, that

the hill also may perturb the airflow at the level of the upper precipitating cloud, perhaps even upwind of the hill, thus augmenting P and the surface rainfall rate. However, even with the crudest representation of the dynamics, the degree of agreement with the observed rainfall rates over the south Wales hills confirmed that the washout of a low-level orographically produced cloud is a major mechanism whereby precipitation over hills is enhanced. (Humphreys-ISWS)
W77-10330

THE APPLICATION OF A DETERMINISTIC MODEL TO A SEMIARID BASIN (APPLICATION DU MODELE A DISCRETISATION SPATIALE A UN BASSIN VERSANT SEMI-DESERTIQUE),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2A.
W77-10424

SIMULATION OF THE HYDROLOGICAL CYCLE OVER THE TISZA VALLEY USING ATMOSPHERIC WATER VAPOUR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W77-10427

CHARACTERISTICS OF RAINFALL CELL PATTERNS IN THE SOUTHEAST COASTAL PLAIN AREAS OF THE USA, AND A COMPUTER SIMULATION MODEL OF THUNDERSTORM RAINFALL,
Middle East Technical Univ. Ankara (Turkey).
A. U. Sorman.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 214-221, 1975. 3 fig, 4 ref.

Descriptors: *Model studies, *Simulated rainfall, *Thunderstorms, *Georgia, Rainfall, Computer models, Rainfall disposition, Demonstration watersheds, Hydrology, Stochastic processes, Rainfall density, Computer programs, Precipitation(Atmospheric), Distribution patterns.
Identifiers: *Tifton(Ga).

Characteristics of rainfall cell patterns were studied from data collected from a dense rain gauge network located over the Little River Experimental Watershed near Tifton, Georgia. Characteristics of thunderstorm rainfall cell parameters, such as cell shape, size, cell duration, temporal and spatial variation of rainfall intensity, and direction and orientation, of cells were analyzed. Distribution functions and their parameters for generating a storm rainfall model stochastically were discussed. A method was suggested for generating synthetic rainfall cells and for combining cells to form rainfall patterns for statistical comparison with actual surface storm patterns. A conceptual model of thunderstorm rainfall was formulated from the observed storm cell characteristics. The model was coded for a digital computer, and a number of rainfall events were generated by the dynamic model, which is based on the stochastic generation of rainfall cell patterns. The model was validated with events observed on the Little River during the summers of 1968, 1969, and 1970. It was suggested that the simulation model can be used in conjunction with basin models for the generation of synthetic streamflow, and this study will aid in the efficient use of water resources throughout the coastal plain areas. (See also W77-10419) (Humphreys-ISWS)
W77-10435

A HYDROMETEOROLOGICAL RESEARCH PROGRAM,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
F. A. Huff, and S. A. Changnon, Jr.
Water Resources Bulletin, Vol 13, No 3, p 573-581, June 1977. 3 fig, 4 ref.

Descriptors: *Precipitation(Atmospheric), *Illinois, *Meteorology, *Radar, Rainfall, Urban hydrology, Storm water, Research and development, Rainfall-runoff relationships, Water control.
Identifiers: *Urban precipitation, *Chicago(Ill), Hydrometeorological operational techniques, Radar rainfall measurements, Storm rainfall.

An extensive research program in hydrometeorology has been initiated in the Chicago, Illinois, region. Major objectives are to develop a real-time, prediction-monitoring system for storm rainfall using a combination of weather radar and telemetered rain gauge data. Other objectives include precipitation measurements for hydrologic design, operation, and modeling purposes; definition of space-time characteristics of heavy rainstorms in the Chicago urban area; and establishment of methods for applying the Chicago findings in other cities. Basic components of the field measurement program are a network of over 300 recording rain gauges in 4,000 sq mi in and around Chicago, plus two sophisticated weather radar systems for obtaining real-time information on storm parameters pertinent to optimizing operation of urban water resource systems. The rain gauge networks are used to compile information relevant to design and to operational aspects of urban hydrology. Radars are used primarily in developing the real-time operational techniques. Testing and evaluation of the real-time operational system was done in cooperation with the Metropolitan Sanitary District of Chicago, operator of one of the most complex urban water control systems among major metropolitan areas. (Roberts-ISWS)
W77-10658

VARIABILITY AND ERROR IN RAINFALL OVER A SMALL TROPICAL WATERSHED,
International Inst. of Tropical Agriculture, Ibadan (Nigeria).
E. U. Nwa.
Journal of Hydrology, Vol 34, No 1/2, p 161-169, July 1977. 6 fig, 3 tab, 6 ref.

Descriptors: *Rainfall, *Variability, *Networks, Watersheds(Basins), Rain gages, Network design, Rain, Foreign countries, Foreign research, Analytical techniques, Data processing, Hydrology, Meteorology, Tropical regions.
Identifiers: *Nigeria, Error analysis, *Tropical watersheds.

An analysis is presented of the variability of rainfall over a small tropical watershed and also examined the errors involved in measuring rainfall over such small areas. Using a gauge density of 8.86 ha/gauge (5-rain-gauge network) as standard, it was shown that a 3-rain-gauge network would be sufficient for the watershed and would keep the average coefficient of variation below 10% and the average error in mean rainfall below 0.8 mm. The average error in mean rainfall and the average coefficient of variation are exponential functions of the mean rainfall and the number of rain gauges or gauge density. (Sims-ISWS)
W77-10769

PRELIMINARY EVALUATION OF THE 1976 RAIN MODIFICATION PROJECT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W77-10774

AN EXAMINATION OF THE RAINFALL DISTRIBUTION OVER THE TARGET AREA OF THE COLORADO RIVER MUNICIPAL WATER DISTRICT'S WEATHER MODIFICATION PROGRAM,
Colorado River Municipal Water District, Tex.
For primary bibliographic entry see Field 3B.
W77-10775

STOCHASTIC STRUCTURES OF THE LOCAL PATTERN OF PRECIPITATION,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
P. Todorovic, and D. Woolhiser.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 15, Colorado State University, Fort Collins, p 15-1 - 15-37, 1976. 7 fig, 30 ref.

Descriptors: *Water resources, *Stochastic processes, *Model studies, *Local precipitation, Rainfall, Precipitation intensity, Probability, Distribution, Temporal distribution, Mathematical models, Statistical methods, Mathematical studies, Mathematics, Analytical techniques, Theoretical analysis, Equations, Markov processes, Precipitation(Atmospheric).

The objective of this chapter was to present a general stochastic description of the point precipitation process and then to develop simplified mathematical models. A stochastic description of the local precipitation process has many practical applications in engineering and agriculture. Design of surface water drainage structures or flood control works requires some knowledge of the statistical distribution of flood peaks. When runoff records are too short or unavailable, a hydrologic model frequently is used to develop the linkage between the precipitation and runoff processes. All the mathematical models considered were various functionals of a non-negative intermittent stochastic process positive on random time intervals. (See also W77-10439) (Humphreys-ISWS)
W77-10787

FLOODS AND DROUGHTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10788

AN EVALUATION OF PRECIPITATION GAGE DENSITY IN A MOUNTAINOUS TERRAIN,
Stephen F. Austin State Univ., Nacogdoches, Tex. School of Forestry.
M. Chang.
Water Resources Bulletin, Vol 13, No 1, p 39-46, February 1977. 2 fig, 1 tab, 10 ref. OWRT A-023-WVA(1).

Descriptors: *Precipitation gages, *West Virginia, *Network design, Correlation analysis, Spatial distribution, Topography, Rainfall, Mountains, Hydrology, Instrumentation.
Identifiers: *Precipitation gage density, Inter-station analysis, Reflecting distance, Elevation difference, Land slope.

Inter-station analysis was employed to evaluate the adequacy of the precipitation network in topographically complex West Virginia. A 25-year period was determined as the minimum length of record needed for relatively stable and fairly accurate estimates of long-term (50-year) precipitation and in frequency analysis. Data from the 83 National Weather Service stations with 25-year records were adjusted for consistency and were evaluated separately by zones east (31 stations) and west (52 stations) of the Appalachian divide. Correlation coefficients (r) and average standard errors of estimate were computed for all station pairs within 50 miles distance eliminated using elevation and land slope as the criteria in network design in this mountainous terrain. A network with

(r) = 0.9 estimates annual precipitation with accuracy as great as 5%, but requires about 250 additional gages (i.e., about 200% of the present density). (Lee-ISWS)
W77-10800

2C. Snow, Ice, and Frost

STABILITY ANALYSIS OF FLOATING AND SUBMERGED ICE FLOES,
ARCTEC, Inc., Columbia, Md.
M. S. Uzuner.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13041, p 713-722, July 1977. 2 fig, 1 tab, 21 ref, 2 append. NSF GK3918X1.

Descriptors: *Ice jams, *Ice breakup, *Model studies, Mathematical models, Ice loads, Rivers, Ice cover, Stability, Froude number, Flow, Drag, Hydraulics.
Identifiers: Ice formation.

The mathematical model was based on the moment equilibrium of an ice floe resting beneath a uniformly thick ice cover. It was argued that the expression derived for incipient motion of ice block is similar to the relation developed for the stability of prisms resting on the riverbed. The critical thickness, densimetric Froude number for floe transport was compared with the number for the submergence of a floe at the upstream end of an ice cover and with Ashton's streamwise force balance analysis for ice floe stability beneath an ice cover. A nondimensional graph (Froude number versus block thickness-flow depth ratio) was presented to summarize the results. The analysis presented herein indicated that fragmented ice covers thicken generally by internal collapse rather than by transport of floes beneath the floating cover. (Sims-ISWS)
W77-10119

SETTLING VELOCITIES OF SMALL ICE CRYSTALS,
Ben Gurion Univ. of the Negev, Beer Sheva (Israel). Research and Development Authority.
For primary bibliographic entry see Field 2B.
W77-10121

EFFECT OF ANTECEDENT CONDITIONS ON FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
R. Pedersen, M. Molnau, and E. S. Yen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 632, Price codes: A03 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, January 1977. 23 p, 7 fig, 10 tab, 10 ref. OWRT A-045-IDA(3).

Descriptors: *Frozen ground, *Frozen soils, Permafrost, Soil types, Floods, Rain, Runoff, Temperature, *Flood damage, Flood control, *Pacific Northwest US, Watersheds(Basins), Idaho, Oregon, Washington, Methodology.
Identifiers: Probability analysis, Antecedent moistures, *Discriminant analysis.

Predicting frozen ground occurrences can be helpful in preventing flood damage in areas that are subject to winter floods. Discriminant analysis was used to study frozen and unfrozen ground runoff events for four watersheds in the Pacific Northwest. Part of the discriminant procedure was used to choose a set of meteorological factors for each area that can distinguish between frozen and unfrozen ground runoff events. These variables were then used to define a system to classify other past or future runoff events. The occurrence of a frozen ground runoff event is dependent on the combination of several meteorological factors interacting together rather than on the influence of one single variable such as the average minimum air temperature. This methodology proved successful for two of the watersheds studied. It was found that a unique set of variables could be used for classification, depending on which watershed is being analyzed.
W77-10175

DELAWARE BAY ICE CONDITIONS, 1977,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W77-10188

A MODEL OF THE MELTING PROCESS OF THE SNOW COVER AS A PART OF CATCHMENT MODELS,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Berlin. Forschungsinstitut fuer Hydrometeorologie.
M. Rachner.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 198-202, 1975. 8 ref, 2 append.

Descriptors: *Model studies, *Water yield, *Snow cover, *Melting, Watersheds(Basins), Snow, Computer models, Foreign research, Foreign countries, *Melt water.
Identifiers: *German Democratic Republic.

The inclusion of a sub-model describing the melting process of the snow cover as part of complex catchment models, requires, in addition to the availability of meteorological data, the consideration of the nature of the catchment area (especially altitude, vegetation, slop aspect) and the investigation of the charactristics of the melting process and the water yield from the snow cover as related to the atmospheric conditions. A model was represented which can be used for operational purposes. The inputs are basic meteorological data (air temperature, air humidity, wind velocity, (etc.). Model output is the water yield obtained from the melting snow cover. (See also W77-10419) (Humphreys-ISWS)
W77-10432

TECHNIQUES FOR MEASURING STRESS IN SEA ICE,
Alaska Univ., College. Inst. of Arctic Environmental Engineering.
R. D. Nelson, M. Tauriainen, and J. Borghorst.
Alaska Sea Grant Report No. 77-1, January 1977. 71 p, 30 fig, 3 tab, 20 ref. SG-04-5-159-35.

Descriptors: *Sea ice, *Stress analysis, *Resources development, Alaska, Measurement, Design, Hazards, Continental Shelf.
Identifiers: *Outer Continental Shelf, Stress measurement.

This report describes two techniques for measuring stress in situ in sea ice sheets. A technique using embedded load cells has been found successful in measuring compressive creep or failure stresses as well as moderate tensile stresses. A stress relief technique has been investigated and found unsuccessful. Design details are presented on transducers for each technique and cold-hardy instrumentation is discussed. A technique using inflated air bags to produce known stress fields is presented. (NOAA)
W77-10507

HEAT TRANSFER CHARACTERISTICS OF MELTING AND REFREEZING A DRILL HOLE THROUGH AN ICE SHELF IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H. Physical Sciences Branch.
Y-C. Yen, and C. Tien.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 368, Price codes: A02 in paper copy, A01 in microfiche. Report 76-12, April 1976. 21 p, 4 fig, 3 ref, append.

Descriptors: *Drill holes, *Ice, *Antarctic, *Model studies, Mathematical models, Melting, Graphical analysis, Freezing, Heat transfer, Heat flow, Heating, Cold regions, Analytical techniques.
Identifiers: Melting rates, Refreezing rates.

The heat transfer processes associated with melting and refreezing a drill hole 500 m in depth and 0.150 m in initial radius through an ice shelf were analyzed approximately. The results were expressed in graphical form showing the time available for experimentation under the hole as a function of heating duration and heating strength. It was found that the refreezing of the drill hole had a much slower rate than the melting of the hole. (Sims-ISWS)
W77-10655

OBSERVATION OF OSCILLATORY ICE STATES IN A SIMPLE CONVECTION EXPERIMENT,
Washington Univ., Seattle. Dept. of Oceanography.
P. Welander.
Journal of Geophysical Research, Vol 82, No 18, p 2591-2592, June 20, 1977. 2 fig, 2 ref. NSF OCE74-13339 A02.

Descriptors: *Freezing, *Melting, *Ice, Laboratory tests, Convection, Heating, Cooling, Temperature, Water temperature, Heat transfer, Ice cover, Water bodies, Oceanography.
Identifiers: *Oscillation ice states.

In an experiment where a body of water is heated internally while it is cooled to freezing from above, self-sustained oscillations may appear with ice forming and disappearing periodically. Application to natural systems was considered. (Sims-ISWS)
W77-10656

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS.
National Aeronautics and Space Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-16561, Price codes: A18 in paper copy, A01 in microfiche. Report NASA SP-391, Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California. National Aeronautics and Space Administration, Washington, D.C., 1975. 438 p. A. Rango, editor.

Descriptors: *Remote sensing, *Snow cover, *Conferences, Satellites(Artificial), Aircraft, Snow, Snowmelt, Runoff, Vegetation, Mountains, Surveys, Data processing, Analytical techniques, Flood forecasting, Water management(Applied), Irrigation, Hydroelectric power, Reservoirs, Projects, Water resources, Water supply.
Identifiers: *LANDSAT, *NOAA satellites.

Recent progress in extracting meaningful snow information from satellite data led to the institution of a NASA Applications Systems Verification Test (ASVT) on Operational Applications of Satellite Snowcover Observations. Nine operational water management agencies in the Western United States are participating in the ASVT in cooperation with NASA. The Workshop on Operational Applications of Satellite Snowcover Observations was held primarily to bring the various cooperating agencies together for an information exchange of analysis techniques, results, and problem solving. Twenty-eight scientific papers were presented which covered the photo-interpretation and digital techniques used in analyzing LANDSAT and

NOAA satellite data, the use of snowcover observations in streamflow forecasting, and new advances in extraction of snowpack parameters, other than snow extent, employing a variety of remote sensors. An additional day-long working session provided the participants with a chance to examine and to try the various techniques used for obtaining snowcovered area and with an opportunity to discuss the snow mapping ASVT activities with the various investigators. (See W77-10663 thru W77-10689) (Sims-ISWS)
W77-10662

AN OVERVIEW OF THE APPLICATIONS SYSTEM VERIFICATION TEST ON SNOWCOVER MAPPING,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 1-12, 1975. 5 fig, 5 tab, 2 ref.

Descriptors: *Remote sensing, *Snow cover, *Mapping, Satellites(Artificial), Watersheds(Basins), Snowmelt, Runoff, Water resources, Projects, Flood control, Irrigation, Hydroelectric power, Reservoirs, Water management(Applied).
Identifiers: *LANDSAT.

The capability of the LANDSAT and NOAA satellites to measure accurately snowcovered area on various sized watersheds has been demonstrated by a number of investigators. Additionally, recent research has shown a highly significant statistical relationship between satellite-derived snowcovered area at the beginning of the snowmelt period and seasonal runoff. The decision was made, therefore, to test the results of several satellite snowcovered area studies in an Applications Systems Verification Test (ASVT) Program where quasioperational evaluations of total technical capability are performed. The objective of the ASVT's was to provide all the information necessary for a potential user to make effective decisions concerning the implementation of the new remote sensing technology in an operational applications system. The ongoing Operational Applications of Satellite Snowcover Observations (OASSO) Project became part of the ASVT Program in July 1975, and the project described in this paper. In cooperation with various operational water management agencies in Arizona, California, Colorado, and Oregon, the OASSO Project is scheduled for completion in September 1978. (See also W77-10662) (Sims-ISWS)
W77-10663

THE APPLICATION OF HYDROMETEOROLOGICAL DATA OBTAINED BY REMOTE SENSING TECHNIQUES FOR MULTIPURPOSE RESERVOIR OPERATIONS,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 4A.
W77-10664

INTERPRETATION OF SNOWCOVER FROM SATELLITE IMAGERY FOR USE IN WATER SUPPLY FORECASTS IN THE SIERRA NEVADA,
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
For primary bibliographic entry see Field 4A.
W77-10665

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS IN RIO GRANDE DRAINAGE OF COLORADO,
Soil Conservation Service, Denver, Colo.
For primary bibliographic entry see Field 4A.
W77-10666

OPERATIONAL APPLICATION OF SATELLITE SNOWCOVER OBSERVATIONS-NORTHWEST UNITED STATES,
Bonneville Power Administration, Beaverton, Oreg. Hydrology Section.
For primary bibliographic entry see Field 7B.
W77-10667

THE OPERATIONAL PROGRAM OF SATELLITE SNOWCOVER OBSERVATION AT NOAA/NESS.
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W77-10668

USE OF AREAL SNOW COVER MEASUREMENTS FROM ERTS-1 IMAGERY IN SNOWMELT-RUNOFF RELATIONSHIPS IN ARIZONA,
Arizona Univ., Tucson.
J. S. Aul, and P. F. Ffolliott.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 103-112, 1975. 1 tab, 7 ref.

Descriptors: *Remote sensing, *Snow cover, *Runoff, *Arizona, Satellites(Artificial), Snowpacks, Snow, Snowmelt, Runoff, Data processing, Analytical techniques, Streamflow, Rivers, Watersheds(Basins), Mapping, Water resources.
Identifiers: *Black River Watershed(Ariz), *ERTS data.

Analyses of methods of interpreting ERTS-1 imagery to measure areal snow cover and of the relationship of areal snow cover and runoff were among the objectives in this study of use of ERTS-1 imagery for forecasting snowmelt-runoff relationships. Nearly one-half of the scans of ERTS-1 imagery analyzed over the study period were obscured by cloud cover, which may preclude dependence on satellite imagery alone for monitoring snow cover depletion in Arizona. Differences among observers in estimating areal snow cover suggest difficulty in using ERTS imagery for this purpose unless an observer is familiar with the area. None of the methods of interpretation employed to measure areal snow cover could be ruled unusable, with the method to be used dependent on the investment to be made, the level of precision desired, and whether a map of snow cover extent is wanted. Estimates of areal snow cover from ERTS-1 imagery were similar to comparable estimates obtained by low-altitude aerial reconnaissance. A significant relationship between snow cover and subsequent runoff during the snowpack depletion period for the year of study suggests that measures of areal snow cover obtained from ERTS imagery may become a valuable tool in forecasting snowmelt runoff in Arizona. (See also W77-10662) (Sims-ISWS)
W77-10669

UTILIZATION OF LANDSAT MONITORING CAPABILITIES FOR SNOWCOVER DEPLETION ANALYSIS,
Wyoming Univ., Laramie. Water Resources Research Inst.
A. G. Thompson.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 113-127, 1975. 3 fig, 2 tab, 8 ref.

Descriptors: *Remote sensing, *Snow cover, *Runoff, *Wyoming, Satellites(Artificial), Snowpacks, Snow, Snowmelt, Melting, Streamflow, Rivers, Forecasting, Data processing, Watersheds(Basins), Hydrology.
Identifiers: *LANDSAT data, Snowcover depletion.

LANDSAT images for three snowmelt seasons have been utilized to map and to analyze snowcover depletion on a small river basin in southeastern Wyoming. Results indicated that snowcover-runoff curves established from repetitive LANDSAT coverage may be used in conjunction with streamflow data to provide low-cost seasonal runoff forecasts having a high degree of accuracy. Additionally, detectable variations within a snowpack might provide temporal estimates of peak flows. (See also W77-10662) (Sims-ISWS)
W77-10670

OPERATIONAL USE OF LANDSAT IMAGERY FOR THE ESTIMATION OF SNOW AREAL EXTENT,
California Univ., Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 7B.
W77-10671

OPERATIONAL APPLICATIONS OF NOAA-VHRR IMAGERY IN ALASKA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W77-10672

EMPLOYMENT OF SATELLITE SNOWCOVER OBSERVATIONS FOR IMPROVING SEASONAL RUNOFF ESTIMATES,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 4A.
W77-10673

APPLICATIONS OF SATELLITE SNOW COVER IN COMPUTERIZED SHORT-TERM STREAMFLOW FORECASTING,
For primary bibliographic entry see Field 4A.
W77-10674

SIERRA NEVADA SNOW MELT FROM SMS-2,
National Environmental Satellite Service, Redwood City, Calif. Satellite Field Services Station.
L. C. Breaker, and M. C. McMillan.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 187-197, 1975. 3 fig, 1 tab, 8 ref.

Descriptors: *Remote sensing, *Snow cover, *Satellites(Artificial), Snowmelt, Runoff, Data processing, Analytical techniques, Melting, Snowpacks, Streamflow, Rivers, Watersheds(Basins), Hydrology.
Identifiers: *Sierra Nevada(Calif), Film loops, SMS satellite data.

A film loop from SMS-2 imagery shows snowmelt over the Sierra Nevadas from May 10 to July 8, 1975. The sequence indicated a successful application of geostationary satellite data for monitoring dynamic hydrologic conditions. (See also W77-10662) (Sims-ISWS)
W77-10675

SYNOPSIS OF CURRENT SATELLITE SNOW MAPPING TECHNIQUES, WITH EMPHASIS ON THE APPLICATION OF NEAR-INFRARED DATA,
Environmental Research and Technology, Inc., Concord, Mass.
J. C. Barnes, and M. D. Smallwood.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 199-213, 1975. 5 fig, 1 tab, 8 ref. NASA NAS9-13305.

Descriptors: *Remote sensing, *Snow cover, *Mapping, *Reflectance, Satellites(Artificial), Snowpacks, Snow, Data processing, Analytical techniques, Snowmelt, Runoff, Hydrology.
Identifiers: *Skylab data, S192 imagery, S192 bands.

The Skylab EREP S192 Multispectral Scanner data have provided, for the first time, an opportunity to examine the reflectance characteristics of snowcover in several spectral bands extending from the visible into the near-infrared spectral region. The analysis of the S192 imagery and digital tape data indicated a sharp drop in reflectance of snow in the near-infrared, with snow becoming essentially non-reflective in Bands 11 (1.55-1.75) micrometers and 12 (2.10-2.35 micrometers). Two potential applications to snow mapping of measurements in the near-infrared spectral region are possible: (1) the use of a near-infrared band in conjunction with a visible band to distinguish automatically between snow and water droplet clouds; and (2) the use of one or more near-infrared bands to detect areas of melting snow. (See also W77-10662) (Sims-ISWS)
W77-10676

APPROACHES TO DIGITAL SNOW MAPPING WITH LANDSAT-1 DATA,
Zurich Univ. (Switzerland). Dept. of Geography.
K. I. Itten.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 235-247, 1975. 5 fig, 1 tab, 15 ref.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, Satellites(Artificial), Forests, Mountains, Mapping, Computers, Data processing, Snowpacks, Vegetation, Classification, Snow.
Identifiers: *LANDSAT data.

By applying the same LANDSAT-1 data to 3 substantially different image processing systems, a snow mapping task was performed. LARSYS Ver. 3, STANSORT-2, and General Electric Image-100 did all the jobs of detecting the snowline in forested mountainous terrain and determining the snowcovered area. While the control and accuracy achieved with LARSYS is remarkable, time and effort to perform the processing favor the systems STANSORT and Image-100. The experiences and results demonstrate the need for a fast interactive system for operational snowmapping with multispectral satellite data. (See also W77-10662) (Sims-ISWS)
W77-10677

AN ALL DIGITAL APPROACH TO SNOW AREAL MAPPING AND SNOW MODELING,
California Univ., Davis.
V. R. Algazi, and M. Suk.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 249-257, 1975. 2 fig, 12 ref. NASA NGL 05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Model studies, Mathematical models, Ablation, Albedo, Snowpacks, Snowmelt, Melt water, Runoff, Temperature, Water resources, Satellites(Artificial), Mapping, Data processing, Hydrology.

A study was undertaken to incorporate remote sensing data into a spatially distributed model of snowpack evolution. Preliminary results were presented on the estimation of primary parameters needed in such a model. (See also W77-10662) (Sims-ISWS)
W77-10678

DIGITAL SNOW MAPPING TECHNIQUE USING LANDSAT DATA AND GENERAL ELECTRIC IMAGE 100 SYSTEM,
General Electric Co., Beltsville, Md.
W. C. Dallam, and J. Foster.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 259-278, 1975. 11 fig, 1 tab, 4 ref.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, *Wyoming, Satellites(Artificial), Equipment, Data processing, Watersheds(Basins), Snowpacks, Mapping, Runoff, Snowmelt, Vegetation, Forests, Rocks, Mountains, Water resources.
Identifiers: *LANDSAT data, *Dinwoody Watershed(Wyo).

The need for rapid and reliable snow mapping using LANDSAT and future satellite data has been identified. In this study, a technique and procedures using General Electric IMAGE 100 system were derived for performing a snow cover analysis of small watersheds for quasi-operational application. The study area was the Wind River Mountains of west central Wyoming. A small watershed, Dinwoody Creek, was selected as a test site. LANDSAT data and U-2 imagery were used in the analysis. From a minimal snowcover LANDSAT scene, multispectral analysis was performed, yielding the distribution of forest, bare rock, grassland, water, and snow within the watershed. The forest and bare rock themes were saved and registered with other scenes containing greater snow cover. Likewise, elevation contours from a digitized map were stored and superimposed over the snowpack areas. Analysis of the distribution of the snowcover was facilitated by superimposing the themes and map. For any one watershed, the themes (forest, bare rock, and grassland) and map are constant. From the receipt of the digital LANDSAT tapes, approximately three quarters of an hour have been required for a snowcover analysis. As a result of the described work, it is feasible for small watersheds to have snowcover analysis performed by digital processing in a rapid and reliable manner. The receipt of such timely snowcover analysis by the operational agencies will aid in their management function in the control of reservoirs and in water supply forecasting. (See also W77-10662) (Sims-ISWS)
W77-10679

SNOW COVER MONITORING BY MACHINE PROCESSING OF MULTITEMPORAL LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
S. G. Luther, L. A. Bartolucci, and R. M. Hoffer.
In: Operational Applications of Satellite Snowcover Observations: Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 279-294, 1975. 10 fig, 3 tab. NASA NAS5-21880.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, *Colorado, Satellites(Artificial), Data processing, Mapping, Snowpacks, Mountains, Ablation, Snowmelt, Runoff, Water resources.
Identifiers: *LANDSAT data, *Animas River Watershed(Colo).

LANDSAT frames were corrected geometrically and data sets from six different dates were overlaid to produce a 24 channel (six dates and four wavelength bands) data tape. Changes in the extent of the snowpack could be determined accurately and easily using a change detection technique on data which had previously been classified by the LARSYS software system. A second phase of the analysis involved determination of the relationship between spatial resolution or data sampling frequency and accuracy of measuring the area of the snowpack. (See also W77-10662) (Sims-ISWS)
W77-10680

SNOWCOVER MAPPING BY MACHINE PROCESSING OF SKYLAB AND LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
L. A. Bartolucci, R. M. Hoffer, and S. G. Luther.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 295-311, 1975. 7 fig, 3 tab, 11 ref. NASA NAS9-13380.

Descriptors: *Remote sensing, *Snow cover, *Analytical techniques, Satellites(Artificial), Data processing, Mapping, Snowpacks, Mountains, Classification, Topography, Computers, Snowmelt, Runoff, Water resources.
Identifiers: *LANDSAT data, *SKYLAB data, Computer aided analysis.

SKYLAB and LANDSAT MSS data were analyzed using computer-aided analysis techniques (CAAT) developed at LARS. Results indicated that the middle infrared wavelength bands of the SKYLAB S-192 scanner would allow effective discrimination between snowcover and water-droplet clouds, whereas the limited spectral response of the LANDSAT-1 or 2 scanners do not allow such spectral discrimination. In the next phase of the current investigation, five spectral classes of snowcover were defined and mapped. The five classes were found to be related to differences in the proportion of snow and forest cover in the individual resolution elements. In addition, topographic data (elevation, slope, and aspect) were digitally registered onto the SKYLAB and LANDSAT data to determine their influence on snowpack characteristics. Combining the results with the digital topographic data allowed acreage estimates of the various classes of snowcover to the tabulated according to elevational zones for either the entire data set or on an individual watershed basis. (See also W77-10662) (Sims-ISWS)
W77-10681

A PROGRESS REPORT ON ESTIMATING SNOW DEPTH USING VHRR DATA NOAA ENVIRONMENTAL SATELLITES,
National Environmental Satellite Service, Washington, D.C.
D. F. McGinnis, Jr.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 313-324, 1975. 5 fig, 6 ref.

Descriptors: *Remote sensing, *Snow cover, *Southeast US, Satellites(Artificial), Snow, Depth, Regression analysis, Data processing, Albedo, Reflectance, Analytical techniques, Computer programs.
Identifiers: *NOAA satellite data.

The NOAA environmental satellites provide daily coverage of the Earth in the visible (0.6-0.7 micrometer) and thermal (10.5-12.5 micrometers) spectral bands. The ground resolution of the Very High Resolution Radiometer (VHRR) is 1 km at nadir. The improved resolution in the visible permits more detailed observations of snow features than was possible with previous operational satellites. A densitometer examination of a visible-band image from Feb. 11, 1973, which shows heavy snow cover in considerable detail over areas extending from Alabama to North Carolina, indicates that, in general, there is direct correlation between increasing brightness and increasing snow depths. A power regression analysis of greatest satellite brightness versus greatest snow depth for 201 data pairs produced a correlation

coefficient of 0.86. Similar analysis of five late winter and early spring cases resulted in much lower correlations. (See also W77-10662) (Sims-ISWS)
W77-10682

A COMPARISON OF OPERATIONAL AND LANDSAT-AIDED SNOW WATER CONTENT ESTIMATION SYSTEMS,
California Univ., Berkeley. Social Sciences Group.
J. M. Sharp, and R. W. Thomas.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 325-344, 1975. 4 fig, 20 ref. NASA NGL05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Moisture content, *California, Satellites(Artificial), Costs, Economics, Runoff, Snowmelt, Water resources, Water supply, Analytical techniques, Mathematical models, Surveys, Snow, Hydrology.
Identifiers: *LANDSAT data.

This study described how LANDSAT imagery can be cost-effectively employed to augment an operational hydrologic model. Attention was directed toward the estimation of snow water content, a major predictor variable in the volumetric runoff forecasting model presently used by the California Department of Water Resources. A stratified double sampling scheme was supplemented with qualitative and quantitative analyses of existing operations to develop a comparison between the existing and satellite-aided approaches to snow water content estimation. Results showed a decided advantage for the LANDSAT-aided approach. (See also W77-10662) (Sims-ISWS)
W77-10683

RED AND NEAR-INFRARED SPECTRAL REFLECTANCE OF SNOW,
Cold Regions Research and Engineering Laboratory, Hanover, N.H.
H. W. O'Brien, and R. H. Munis.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 345-360, 1975. 10 fig, 3 ref.

Descriptors: *Reflectance, *Snow, *Remote sensing, Laboratory tests, Infrared radiation, Snow cover, Melting, Aging(Physical), Albedo, Density, Physical properties, Data processing.

The spectral reflectance of snow in the range of 0.60 to 2.50 micrometers wavelengths was studied in a cold laboratory using natural snow and simulated preparations of snow. A white barium sulfate powder was used as the standard for comparisen. The high reflectance (usually nearly 100%) of fresh natural snow in visible wavelengths declines rapidly at wavelengths longer than the visible, as the spectral absorption coefficients of ice increase. Aging snow becomes only somewhat less reflective than fresh snow in the visible region and usually retains a reflectance greater than 80%. In the near infrared, aging snow tends to become considerably less reflective than fresh snow. The rate of decline of near-infrared reflectance due to aging is strongly influenced by the history of the snow during aging. Some of the significant parameters which determine the reflectance of snow were discussed and, where possible, results were presented which illustrate the predominant influences. (See also W77-10662) (Sims-ISWS)
W77-10684

REMOTE SENSING OF SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
M. C. McMillan, and J. L. Smith.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 361-373, 1975. 6 tab, 26 ref.

Descriptors: *Remote sensing, *Snow cover, *Radio waves, Satellites(Artificial), Aircraft, On-site investigations, Snow, Density, Albedo, Reflectance, Snowpacks, Water resources, Snowmelt, Melt water, Precipitation(Atmospheric).
Identifiers: *LANDSAT data.

Albedo or satellite radiance measurements can be used to estimate average snowpack density by means of a multiple linear equation. The in situ data equation predicted density with a correlation (r squared) of 0.79 and a standard error of 0.027 gm/cu cm. The data from LANDSAT-1 were not as significant in a similar equation, possibly because of the large field of view. (See also W77-10662) (Sims-ISWS)
W77-10685

MICROWAVE EMISSIONS FROM DRY AND WET SNOW,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
T. C. Chang, and P. Gloersen.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 399-407, 1975. 5 fig, 12 ref.

Descriptors: *Remote sensing, *Snow cover, *Microwaves, *Model studies, Mathematical models, Snow, Measurement, Satellites(Artificial), Temperature, Melting, Snowmelt, Melt water, Ice, Water resources.
Identifiers: *Microwave emission.

A microscopic model was developed to study the microwave emission from snow. In the developed model, the individual snow particles are considered to be the scattering centers. Mie scattering theory for spherical particles then was used to compute the volume scattering and the extinction coefficients of the closely packed scattering spheres, which were assumed not to interact coherently. The results of the computations showed significant volume scattering effects in the microwave region which result in low observed emissivities from cold, dry snow. In the case of wet snow, the microwave emissivities are increased considerably, in agreement with earlier experimental observations in which the brightness temperatures have increased significantly at the onset of melting. (See also W77-10662) (Sims-ISWS)
W77-10687

APPLICATION OF BAYESIAN DECISION THEORY TO AIRBORNE GAMMA SNOW MEASUREMENT,
National Weather Service, Portland, Oreg. River Forecast Center.
V. C. Bissell.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 409-420, 1975. 3 fig, 9 ref.

Descriptors: *Remote sensing, *Snow cover, *Gamma rays, Aircraft, Model studies, Mathematical models, Snow, Measurement, Snowmelt, Runoff, Radiation, Surveys.
Identifiers: Bayesian decision theory.

Measured values of several variables are incorporated into the calculation of snow water equivalent as 'measured' from an aircraft by snow attenuation of terrestrial gamma radiation. Bayesian decision theory provides a 'best' snow water equivalent measurement by taking into account the uncertainties in the individual measurement variables and 'filtering' information about the measurement variables through prior notions of what the calculated variable (water equivalent) should be. Generalizations of principles involved in the application were presented in subsequent discussion. (See also W77-10662) (Sims-ISWS)
W77-10688

SUMMARY OF THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS WORKING SESSION - AUGUST 20, 1975,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
V. V. Salomonson, and A. Rango.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 421-426, 1975.

Descriptors: *Remote sensing, *Snow cover, *Conferences, *Satellites(Artificial), Snowmelt, Snow, Runoff, Mapping, Data processing, Analytical techniques, Computers, Management, Water management(Applied), Water resources, Water supply.
Identifiers: *LANDSAT data, *NOAA satellites data.

Following two days of excellent formal paper presentations and constructive discussions, a working session dealing primarily with problems, techniques for analysis, possible solutions, and recommendations for future work pertaining directly to the Snow Applications Systems Verification Test (ASVT) study areas was held. This session treated in greater detail some of the points brought out in the discussions during the previous two days. Various techniques for reducing the satellite data to a form useable by the operational agencies were covered in mini-presentations and discussions by the operational satellite-snow interpretive personnel. The mini-presentations were followed by open discussion and actual manipulation of data by those present in the audience. Similar mini-presentations were made by operational agency streamflow forecasters on how satellite-derived snow data could be incorporated into runoff forecasting methods, potential influence on management decisions, and eventual transfer to completely operatioal use. A general discussion dealing with the directions that the snow ASVT should take as a result of the previous presentations and discussions concluded the working session. (See also W77-10662) (Sims-ISWS)
W77-10689

2D. Evaporation and Transpiration

PARAMETERIZATION OF SURFACE EVAPORATION RATE FOR USE IN NUMERICAL MODELING,
National Weather Service, Silver Spring, Md. Techniques Development Lab.
T-W Yu.
Journal of Applied Meteorology, Vol. 16, No. 4, p 393-400, April 1977. 7 fig, 26 ref, 1 append.

Descriptors: *Evaporation, *Model studies, *Mathematical models, Moisture, Energy budget, Solar radiation, Humidity, Soil moisture, Heat transfer, Temperature, Winds, Meteorology.
Identifiers: Parameterization, *Surface evaporation rates.

Numerical models require parameterization of surface evaporation rates when a surface energy budget equation is included in the calculation of the surface temperature. Techniques for parameterizing surface moisture and evaporation were reviewed. Two methods in particular were investigated with observational data taken from the Wangara, the O'Neill, the Kerang, and the Davis experiments. Method I was based on parame-

terization of the surface moisture with the surface evaporation computed through the flux-profile similarity relationships. Method II was based on a modified form of the Penman equation which requires a knowledge of solar radiation and soil heat flux to calculate surface evaporation. Comparisons of the results of these methods were made with observations. Method I failed to account for condensation, which is often observed during the night. Method II was shown to be superior to Method I in the calculation of surface evaporation for both day and night. (Sims-ISWS)
W77-10111

INFLUENCE OF ROW SPACING AND STRAW MULCH ON FIRST STAGE DRYING,
Agricultural Research Service, Temple, Tex. Southern Region.
J. E. Adams, G. F. Arkin, and J. T. Ritchie.
Soil Science Society of America Journal, Vol. 40, No. 3, p 436-442, May-June 1976. 10 fig, 2 tab, 14 ref.

Descriptors: *Evaporation, Grain sorghum, *Drying, Plant populations, Mulching, Crop production, Crop response, *Cultivation.
Identifiers: Leaf area index, Crop canopy, Row spacing.

Evaporation during first stage drying was measured with evaporation plates on the soil surface in grain sorghum plots with 25-, 50-, and 100-cm row spacings, during several stages of grain sorghum development in 1972 and 1973. Evaporation during first stage drying was affected by row spacing, leaf area index (LAI), and soil shading. Both LAI and soil shading were related to row spacing and plant population. The more complete plant canopy of gran sorghum with narrow-row spacing decreased penetration of radiant energy to the soil surface and reduced the evaporation rate of soil water during first stage drying. Evaporation was greatest during the early part of the season when shading was least and lowest during boot stage and pollination, when all leaves were fully expanded and provided maximum plant canopy and soil shading. Narrow-row spacing established an earlier, and more complete plant canopy than conventional 100-cm row spacing and shaded more of the soil surface from early vegetative growth to maturity. Soil surface shaded near solar noon was a better indicator of first stage evaporation beneath a canopy than LAI. The combined effect of a mulched surface and a plant canopy on reducing evaporation was the produce of the fractional reduction in potential evaporation resulting from the plant canopy and the evaporation resulting from the mulched surface with no canopy cover. An empirical equation was developed from the evaporation data for use in calculating first stage evaporation as related to potential evaporation, fraction of the soil surface shaded, and mulch rate. (Skogerboe-Colorado State)
W77-10286

FIELD STUDY OF EVAPORATION - ANALYSIS OF DATA FROM EUCUMBENE, CATARACT, MANTON AND MUNDARING,
Bureau of Meteorology, Melbourne (Australia).
R. D. Hoy, and S. K. Stephens.
Australian Water Resources Council Technical Paper No. 21, 1977. 64 tab, 47 fig, 74 ref, 5 append.

Descriptors: *Evaporation, *Estimating, *Lakes, *Reservoir evaporation, Heat balance, Water balance, Evaporation pans, Water loss, Instrumentation, Measurement, Variability, *Australia.
Identifiers: Lake Eucumbene(N.S.W.), Cataract Reservoir(N.S.W.), Manton Reservoir(N.T.), Mundaring Reservoir(W.A.).

Evaporation from four large Australian lakes in different climatic regions was determined over periods of two years or more, using the Heat Budget method, the Water budget method, the Bulk Aerodynamic method, the Pan Conversion method and pan observations. Of these, the Heat Budget method is known to give the most reliable estimate of lake evaporation, and the other methods are compared with this. Instrumentation, calculations, and results, with standard errors, are described and compared for each lake, and criteria are offered for the selection of a method for operational evaporation determinations. (CSIRO)
W77-10376

CONSEQUENCES OF GROUNDWATER EXTRACTION ON EVAPOTRANSPIRATION AND SATURATED-UNSATURATED FLOW,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
For primary bibliographic entry see Field 4B.
W77-10422

WATER REQUIREMENTS FOR MESQUITE (PROSOPIS JULIFLORA),
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
J. M. Tromble.
Journal of Hydrology, Vol. 34, No. 1/2, p 171-179, July 1977. 4 fig, 2 tab, 11 ref.

Descriptors: *Water requirements, *Mesquite, *Evapotranspiration, Runoff, Indexing, Water users, Water table, Vegetation, Water resources, Water utilization.
Identifiers: Prosopis juliflora, *Water table fluctuations, Streambanks, Uplands, Vegetation density, Abstracted water, Index values, Stream channel.

Evapotranspiration (ET) determined by different investigators, compared with values determined by the White and Troxell methods, showed that their values provided reasonable estimates and that utilizing diurnal water table fluctuations furnished a a method of computing ET with less than 100% vegetation density. Average daily maximum ET rates for June were calculated, and ratios were compared with values from other independent studies. Since ET rates, determined by White and Troxell methods, indicated plausible values of water use when compared to other independent studies, the ET rates could be considered index values useful as guidelines for water abstracted by mesquite. Water table elevation measurements on a shallow perched aquifer under a mesquite thicket were used to calculate ET for time periods when the water table elevation varied diurnally. Average daily maximum ET values for June, when annual ET rates were highest, for the three years as predicted by the daily rate, White and Troxell methods were 1, 61, 10.10 and 12.17 mm, respectively. (Roberts-ISWS)
W77-10770

SURFACE ROUGHNESS OF CROPS AND POTENTIAL EVAPOTRANSPIRATION,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands).
P. J. Slabbers.
Journal of Hydrology, Vol. 34, No. 1/2, p 181-191, July 1977. 5 fig, 4 tab, 25 ref.

Descriptors: *Evapotranspiration, *Roughness coefficient, *Crops, Winds, Grasses, Climatology, Arid climates, Wind velocity, Foreign countries, Foreign research.
Identifiers: *The Netherlands, *Potential evapotranspiration, *Roughness function, Surface roughness, Crop water requirements, Aerodynamic resistance.

A roughness function for grass was derived by Rijtema for climatological conditions in The Netherlands. The function depends on wind speed and crop length and was used to determine the aerodynamics resistance of grass when calculating potential evapotranspiration. An analysis was made of data collected in southern Iran and of data that had been published for northern Iran, Lebanon, and Tunisia to determine whether the function also could be used in calculating crop water requirements under semi-arid and arid conditions. Except for some deviating data for which explanations were presented, agreement was obtained for all crops tested against the original relationship for grass. The importance of taking crop roughness into account in the combination equation, especially for relatively tall crops, was stressed. (Roberts-ISWS)
W77-10771

2E. Streamflow and Runoff

SPATIALLY AVERAGED FLOW OVER A WAVY SURFACE,
Washington Univ., Seattle. Dept. of Oceanography.
J. D. Smith, and S. R. McLean.
Journal of Geophysical Research, Vol. 82, No. 12, p 1735-1746, April 20, 1977. 5 fig, 4 tab, 23 ref.
NSF GA-14178, DES-75-15154.

Descriptors: *Flow, *Sand waves, *Columbia River, Rivers, Reservoirs, Streamflow, Velocity, Beds, River beds, Sediments, Suspended solids, Bed load, Current meters, On-site investigations, Model studies, Data processing, River flow, Nonuniform flow.
Identifiers: *Bonneville Reservoir.

An understanding of the mechanics of nonuniform flow is important in a variety of ecological and geophysical fluid mechanical problems. Moreover, the ability to predict local boundary shear stress on the uneven bed is essential in erosion and sediment transport problems. In order to elucidate the important fluid mechanical phenomena active over natural quasi-two-dimensional bed forms, a series of detailed flow measurements were made above 60- to 100-m-long 1- to 3-m-high dunes in the Columbia River. Velocity profiles obtained by averaging the flow data along lines of constant distance above the riverbed were examined, and it was shown that they can be constructed from well-known uniform flow results used in conjunction with a hypothesis about the structure of internal boundary layers. The approach permits skin friction as well as total boundary shear stress, averaged over one wavelength of the bed form to be determined from spatially averaged velocity profiles and, conversely, provides a mechanism whereby zero-order velocity profiles can be constructed for two-dimensional nonuniform channel flows. Corrections for changes in the bottom roughness parameter caused by bed load transport and for flow stratification induced by suspended load transport were derived and applied in order to make the results consistent with the measured spatially averaged shear stress field. (Sims-ISWS)
W77-10103

THE PLAN SHAPE OF CURRENT RIPPLES IN RELATION TO FLOW CONDITIONS,
Reading Univ. (England). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W77-10132

ASPECTS OF THE GROWTH AND REPRODUCTION OF LABEO CAPENSIS IN THE CALEDON RIVER,
Fort Hare Univ. (South Africa). Dept. of Zoology.
D. P. Baird.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 25-28, 1976. 3 fig, 4 tab, 8 ref.

Descriptors: Freshwater fish, *Fish growth, Fish scales, Sampling, *Reproduction.
Identifiers: *Labeo capensis, Vaal River, *Caledon River(South Africa), Barberspan.

The scale studies indicate that the annulus is a reliable year mark. A linear relationship exists

between anterior scale radius and body length so that backocalculations of length were possible. Males and females had a similar growth rate. The growth rate is similar to that for L. capensis in the Vaal River. Fish under 35 centimetres in length had a sex ratio of 1:1 but in larger fish, only 16% were males. Males reach sexual maturity at a length of 15 to 20 centimetres and females at a length of 20 to 25 centimetres. The spawning season extends from September to March with a peak in November. Fecundity increased with an increase in length from 12 664 for a fish of 22,8 centimetres to 106 286 for a fish of 34,8 centimetres. (So. African Water Info. Center)
W77-10194

A MATHEMATICAL MODEL FOR TRANSIENT OPEN CHANNEL FLOW: A WATER RESOURCE PLANNING AND MANAGEMENT TOOL,
Tennessee Valley Authority, Knoxville.
W. O. Wunderlich.
In: The Tennessee Valley Authority Experience, Proceedings of the First Conference on Case Studies of Large Scale Planning Projects, October 28-Nov. 1, 1974. Hans Knop (Ed.), CP-76-2, Volume 1, International Institute for Applied Systems Analysis, Laxenburg, Austria, 1976, p 627-665. 23 fig, 17 ref.

Descriptors: *Tennessee Valley Authority, *Water resources development, *Open channel flow, *Mathematical models, Unsteady flow, Multiple purpose, Reservoirs, River systems, Computer models, Equations, Systems analysis.

The Tennessee Valley Authority has always been primarily concerned with the effective management and efficient use of its abundant water resources. The three basic multiple uses of flood control, navigation, and power gneration have expanded to include other uses, including recreation and environmental control. This paper describes a mathematical model, its verification, and its appliation to a variety of complex transient flow problem associated with the planning and management operations of the TVA water control system. The mathematical model for unsteady flows in open channels is assumed to be one-dimensional in the sense that the flow charcteristics such as depth and velocity are considered to vary only in the longitudinal direction with time. The channel geometry is three-dimensional. in conclusion, the unsteady flow mathematical model described herein can be efficiently applied to a wide variety of engineering problems. (Bell-Cornell)
W77-10290

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
P. A. Castruccio, H. L. Loats, Jr., T. R. Fowler, and S. L. Frech.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-14576, Price codes: A03 in paper copy, A01 in microfiche. ECO.-75: C-2-1. Executive Summary NAS8-30539. January 1975. 25 p, 10 fig.

Descriptors: *Hydrology, *Planning, *Mathematical models, *Simulation analysis, *Remote sensing, Projects, Watersheds(Basins), Regional development, Computers, Agriculture, Rainfall, Analytical techniques, Flooding, Hydrologic data, Behavior, Runoff, Equations, Systems analysis, *Forecasting.
Identifiers: *Peak flow, Sensitivity analysis, Hydrologic processes.

An improved model for the prediction of peak flow events has been structured, which is specifically designed to take maximum advantage of the data and information stream available from remote sensing. Reported are the results of a project instituted to determine the effectiveness of the new hydrologic planning model and to determine which parameters impact most the minimization of errors associated with the prediction of peak flow events. In the progression of model development, the overall framework has been constructed and five modules simulating the behavior of significant hydrologic processes have been developed, which include: rain occurrence; rainfall spatial correction; subsurface abstractions; overland flow; and point-of-flooding. Four hypotheses have been postualted and then four investigations made to test their validity. The improved model is considerably more sophisticated than conventional hydrologic planning models. In particular, it modules are not simply interconnected, but require feedback. In spite of this complexity, the model is readily adaptable to analog computation with modest amounts of hardware. Within the range of its simplified version, the new model appears to be considerably more accurate than conventional hydrologic planning models. (Bell-Cornell)
W77-10296

LAW OF PROBABILITY FOR TWO LOW WATER VARIABLES,
Direction des Eaux, Baja (Hungary).
I. Zsuffa.
In: Mathematical Models in Hydrology, Vol. 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 233-240, 1974. 4 fig, 7 ref.

Descriptors: *Hydrology, *Probability, *Low flow, Irrigation systems, Runoff, Estimating, Equations, Mathematical models, Systems analysis, *Distribution patterns.
Identifiers: *Distribution function.

To deduce the types of functions suitable for the estimation of the distribution function of two variables $F(x,t) = p(Q < \text{or} = x, T < \text{or} = t)$ which is used for characterizing low flows, the theoretically true exponential distribution of the periods without runoff and the depletion curves were used, the latter described by an exponential function. When the starting value Q of the depletion curve is constant or fixed, the probability distribution of the lowest flows can be described by a power function, while, when the starting value is exponentially distributed, the probability distribution can be characterized by a distribution composed of an exponential function, a power function and various gamma functions. Several methods have been derived for the estimation of the various distribution functions. These estimates are obtained from statistical samples for both function types. The distribution function of two variables can be obtained by repeated application of the equation of the depletion curve. (Bell-Cornell)
W77-10297

ANALYSIS OF THE STOCHASTIC COINCIDENCE OF CERTAIN HYDROLOGICAL PROCESSES,
J. Deri.
In: Mathematical Models in Hydrology, Volume 1; Proceedings of the Warsaw Symposium, July 1971: International Association of Hydrological Sciences Publication No. 100, p 289-298, 1974. 7 fig, 5 ref.

Descriptors: *Hydrology, *Stochastic processes, *Markov processes, Probability, Rivers, Equations, Mathematical models, Systems analysis.
Identifiers: Correlation coefficient, Correlation functions.

This paper discusses the use of correlation coefficients and correlation functions for practical purposes. After giving the definition of the indicator functions of the low stages of two watercourses, the probability of coincidence of the low-stage periods of two streams is defined. Next, the paper enlarges upon the two-dimensional model based on the Markov hypothesis. After giving the definition of the process of drought and low stage, the empirical state-transition-frequency matrix referring to the drought and low-stage coincidence is defined. (Bell-Cornell)
W77-10299

A STOCHASTIC MODEL FOR THE SIMULATION OF THE TEMPERATURE OF A WATERCOURSE,
Electricite de France, Chatou. Div. Exchanges Atmospheriques.
For primary bibliographic entry see Field 2A.
W77-10300

PROBABILISTIC MODELS FOR MULTIPLE AND SYNTHETIC HYDROLOGIC VARIABLES,
Electricite de France, Chatou, France. Service Technologie Generale Applications de l'Electricite et Hydraulique.
For primary bibliographic entry see Field 2A.
W77-10301

END DEPTH UNDER ZERO-INERTIA CONDITIONS,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10302

MODEL STUDIES OF DENVER WHITEWATER CHANNEL,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W77-10304

APPLICATION OF SOME STATISTICAL METHODS FOR THE ESTIMATION OF MINIMUM FLOW,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
N. P. Artemieva, and V. G. Nikitin.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 1-5, 1975. 4 tab, 5 ref.

Descriptors: *Low flow, *Streamflow, *Mathematical models, *Statistical methods, Analytical techniques, Equations, Evaluation, Flow, Monthly, Seasonal, Summer, Winter, Simulation analysis, Foreign research, Foreign countries.
Identifiers: *USSR, Daily low flow.

The statistical homogeneity of observational data on low flows in the Polesskaya Lowland was analyzed by statistical criteria. Spatial generalization of observational data were studied with the help of nonparametric criteria of Kolmogorov and Allexeev. Empirical distributions of modulus coefficients of summer and winter minimum flow (daily and monthly) follow the general probability distribution type common for the majority of gauge lines, i.e., a three parametric gamma distribution with parameters practically equal. The authors determined the parameters of unified curves and their relative errors with regard to the intraserial relations. The paper also gave estimates of the reliability of the results of a combined analysis by several simulated series of empirical distributions of low flow differing in the number of gauge lines under study and the period of observations. Multiple linear regression equations were developed to interrelate the moduli of summer and winter minimum flow (daily and monthly) and the main flow formation factors. (See also W77-10419) (Humphreys-ISWS)
W77-10420

A YEAR ROUND WATER BALANCE MODEL, ITS APPLICATION AND ITS FUTURE,
Ceskoslovenska Akademie Ved, Prague. Inst. of Hydrodynamics.
For primary bibliographic entry see Field 2A.
W77-10421

A HYDROLOGICAL MODEL WITH PHYSICALLY REALISTIC PARAMETERS,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W77-10428

MATHEMATICAL SIMULATION MODELS OF HYDROLOGICAL PROCESSES IN TURKEY,
Aegean Univ., Bornova (Turkey). Faculty of Engineering Sciences.
For primary bibliographic entry see Field 2A.
W77-10430

STATISTICAL MODELLING OF RIVER FLOW BY THE MONTE CARLO METHOD AND EVALUATION OF DISTRIBUTION PARAMETERS AND QUANTITIES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
A. V. Rozhdestvensky, and V. M. Zvereva.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 203-208, 1975. 5 tab, 6 ref.

Descriptors: *River flow, *Statistical models, *Model studies, *Statistical methods, Hydrology, Stream flow, Markov processes, Monte Carlo method, Stochastic processes, Time series analysis, Frequency analysis, Correlation analysis, Foreign research.
Identifiers: *USSR.

Using the Monte Carlo method for modelling river flow, displacement and random scatter of sampling parameters and frequency curve ordinates were established. A fundamental basis for the normalization of river flow was developed. The computation scheme for the estimation of distribution parameters and frequency curve ordinates was tabulated. The sequence of a simple Markov chain was modelled in two ways: (1) With the help of normal correlation for normally distributed random variables-the obtained sequence being transformed into the given distribution law. (2) With the help of normal correlation for non-normal distributions. Numerical realization of the given computation scheme by means of electronic computers made it possible to eliminate the bias (systematic errors) of sampling parameters and frequency curve ordinates and to estimate their random variance. (See also W77-10419) (Humphreys-ISWS)
W77-10433

STOCHASTIC PROPERTIES OF THE PROCESSES TRANSFORMED IN LINEAR HYDROLOGICAL SYSTEMS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
For primary bibliographic entry see Field 2A.
W77-10436

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2A.
W77-10437

A MATHEMATICAL MODEL OF FLOOD WAVES MOVING ALONG A CASCADE OF RESERVOIRS ON A LARGE RIVER,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
I. A. Zheleznyak, and L. B. Byshovets.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 279-283, 1975. 1 fig, 5 ref.

Descriptors: *Flood waves, *Mathematical models, *Rivers, *Reservoirs, Runoff, Flood routing, Watersheds(Basins), Flood stages, Model studies, Foreign countries, Foreign research.
Identifiers: *USSR, *Dnieper River(USSR).

The characteristics of flood waves moving along rivers and reservoirs were described. The main equations of the water movement were developed, and they were applied in calculations of flood runoff transformation in the limits of a river section and a large reservoir. A mathematical model was given for a large cascade of reservoirs (the lower Dnieper was used as an example). The operational experiences of the water management organization during periods of very high flow (the flood of 1970) and very low flow (1972) were described. (See also W77-10419) (Humphreys-ISWS)
W77-10438

STRUCTURE OF NATURAL HYDROLOGIC TIME PROCESSES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10440

GENERATION OF HYDROLOGIC AND WATER RESOURCES SAMPLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10441

DATA COLLECTION, ANALYSIS AND INSTRUMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10442

LONG-RANGE CHANGES,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2A.
W77-10443

FLOOD-PRONE AREAS OF JACKSONVILLE, DUVAL COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
R. B. Stone, L. V. Causey, and D. F. Tucker.
Water-Resources Investigation 76-54 (open-file report), 1976. 1 sheet, 2 fig, 1 tab, 5 ref.

Descriptors: *Floods, *Florida, *Flood forecasting, *Flood profiles, Maps, Flood recurrence interval, Land use, *Jacksonville(Fla).

Floods in the consolidated city of Jacksonville, Duval County, Florida, are caused directly by rainfall which, when combined with storm driven tides, causes rivers or other bodies of water to flood the low lying parts of the county. This map report supplies information on areas subject to floods of 100-year frequency; the information will permit evaluation of alternative uses of such areas. The extent of the 100-year flood is shown on the large-scale map accompanying the report. Also included is an index map showing sections of Duval County where more detailed information on the 100-year flood can be obtained. The major flood of record in the county occurred in 1964 when Hurricane Dora crossed the area. (Woodard-USGS)
W77-10557

MISSOURI RIVER TEMPERATURE EFFECTS IN THE TRANSITION FROM DUNES TO PLANE BED,
Colorado State Univ., Fort Collins; and Geological Survey, Lakewood, Colo. Water Resources Div.
H. Y. Chen, and C. F. Nordin, Jr.
U.S. Army Engineer District, Omaha, December 1976. 41 p, 12 fig, 24 ref, append. M.R.D. Sediment Series No 14.

Descriptors: *Sediment transport, *Water temperature, *Correlation analysis, *Uniform flow, *Open channel flow, Sedimentation, River beds, Navigable rivers, Forecasting, Analytical techniques, Channel morphology, Flow rates.

Seasonal water-temperature changes influence stage-discharge and depth-discharge relations in rivers and in conveyance channels and navigation channels where water discharge is constant. The major influence is related to changes in bed configuration which accompanies water-temperature changes. Stability analysis provides a theoretical basis for predicting bed-configuration changes, and using the theoretical relations with one empirical coefficient defined from field data, graphical relations are developed to use as design curves for estimating the velocity and flow depth, given the design unit water discharge, bed material size distribution, water temperature, and channel slope. The design curves are for channels with bed materials from 0.1 to 0.3 mm median diameters, water temperatures for 0 to 30 deg C, and slopes from 0.00005 to 0.0012. (Woodard-USGS)
W77-10572

IDENTIFICATION OF STRUCTURE AND PARAMETERS OF HYDROLOGIC RUNOFF-MODELS (IDENTIFIKATION VON STRUKTUR UND PARAMETERN HYDROLOGISCHER ABFLUSSMODELLE),
G. Marr.
Wasserwirtschaft, Vol. 67, No. 4, p 94-97, April, 1977. 2 fig, 1 tab, 6 ref.

Descriptors: *Model studies, *Runoff, *Hydrologic data, Equations, Mathematical models, Surface runoff, Urban runoff, Physical properties, Waste water treatment.

A study of hydrologic models was presented. The identification of their structure and relevant parameters was reviewed. Mathematical equations were used to define the parameters by hydraulic values. The models were approximations of the differential equations developed for non-steady runoff. The validity of the results was checked by the use of a transfer function which was derived from measured data. (Collins-FIRL)
W77-10594

A HYDROMETEOROLOGICAL RESEARCH PROGRAM,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 2B.
W77-10658

OPERATIONAL USE OF LANDSAT IMAGERY FOR THE ESTIMATION OF SNOW AREAL EXTENT,
California Univ., Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 7B.
W77-10671

A PROCEDURE FOR THE SELECTION OF OBJECTIVE FUNCTIONS FOR HYDROLOGIC SIMULATION MODELS,
Technion - Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
M. H. Diskin, and E. Simon.
Journal of Hydrology, Vol 34, No 1/2, p 129-149, July 1977. 3 fig, 5 tab, 15 ref, 3 append.

Descriptors: *Model studies, *Hydrology, *Mathematical models, Watersheds(Basins), Runoff, Storage, Evaporation, Precipitation(Atmospheric), Simulation analysis, Civil engineering.
Identifiers: *Model comparisons, Model selection.

Hydrologic simulation models were calibrated by comparing observed data with data generated by the models. The comparison was made in an optimization which is a subset of all data available or observable. The choice of the set of data and of the objective function to be used for any given model is a subjective decision which influences the values of the model parameters and the performance of the model. The set of data used should be comparable to the engineering application for which the model is intended. The objective function can be chosen by a procedure outlined in the article in which a number of possible functions are considered and compared with reference to one or more engineering applications. (Sims-ISWS)
W77-10767

ANALYTICAL EVALUATION OF TECHNIQUES FOR USE OF A LASER DOPPLER VELOCIMETER TO MEASURE FLOW AND TURBULENCE,
Colorado State Univ., Fort Collins. Dept. of Physics.
C. Y. She, and L. S. Wall.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-007 490, Price codes: A02 in paper copy, A01 in microfiche. Report ARO 11876.1-GS, Reprint from Journal of the Optical Society of America, Vol 65, No 1, p 69-77, January 1975. 5 fig, 6 tab, 22 ref.

Descriptors: *Flow, *Turbulence, *Instrumentation, Measurement, Streamflow, Equipment, Analytical techniques, Currents(Water), Model studies, Mathematical models, Mathematical studies, Optical properties.
Identifiers: *Velocimeters, *Doppler effects, Lasers.

Results of autocorrelation functions and power spectral densities of laser Doppler velocimeters in the reference-beam-heterodyning and the cross-beam-mixing mode were derived to handle turbulence measurements, Doppler ambiguity, spatial coherence, and effects of particle concentration and detection aperture. A useful definition of signal-to-noise ratio was given for both correlation and spectral analyses. The signal-to-noise calculation provides a direct comparison of the figures of merit between various arrangements of a laser Doppler velocimeter with methods for signal processing to measure optically the flow properties of a fluid under given experimental conditions. (Sims-ISWS)
W77-10784

SOME REMARKS ON THE STATISTICAL THEORY OF EXTREME VALUES,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2A.
W77-10786

FLOODS AND DROUGHTS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and P. Todorovic.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 16, Colorado State University, Fort Collins, p 16-1 - 16-31, 1976. 11 fig, 3 tab, 51 ref.

Descriptors: *Floods, *Droughts, *Stochastic processes, *Model studies, Forecasting, Theoretical analysis, Mathematical models, Mathematical studies, Statistical methods, Time series analysis, Distributions, Distribution patterns, Analytical techniques.
Identifiers: *Extreme values, Gumbel Distributions, Pearson Type III Distributions.

The main purpose of a statistical theory of extreme values is to forecast future extremes by analyzing observed extremes. The extreme values analysis can be applied to floods, droughts, precipitants, wind speeds, etc. However, in this chapter only floods and droughts were discussed. Stochastic approaches to flood prediction discussed included the Gumbel Distribution, Pearson Type III Distribution, and a method developed by the authors and their co-workers. (See also W77-10439) (Humphreys-ISWS)
W77-10788

MODELING OF STREAM GEOMETRY AND ITS APPLICATIONS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
C-L. Chiu.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 23, Colorado State University, Fort Collins, p 23-1 - 23-27, 1976. 14 fig, 15 ref.

Descriptors: *Model studies, *Streams, *Shape, *Stochastic processes, Rivers, Mathematical models, Velocity, Distribution patterns, Roughness(Hydraulic), Steady flow, Unsteady flow, Hydrographs, Simulation analysis, Analytical techniques, Statistical models, Dispersion.
Identifiers: Stream geometry, Secondary flow.

A technique developed for stochastic modeling and Monte Carlo simulation of irregular channel cross sections was described. Stochastic simulation can be used to generate any number of sets of irregular stream cross sections, which are equally likely to represent a stream. The different sets of cross sections tend to yield different values of a variable of a transport process, for the same time, at the same station, which are scattering around the predicted mean, with variance representing uncertainty in prediction for each time point at each station. Examples of stochastic simulation of irregular cross sections of a stream were coupled with deterministic system models to obtain velocity distributions, flow profile at a gaging station, dispersion in unsteady flow, and secondary flow in a stream. (See also W77-10439) (Humphreys-ISWS)
W77-10791

2F. Groundwater

TRITIUM IN THE MONITORING OF WATER SUPPLY.
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
South African Journal of Science, Vol. 72, No. 7, p 195-196, July 1976. 1 fig, 3 ref.

Descriptors: *Aquifers, *Groundwater recharge, Measurement, *Rainfall, Rain water, Geohydrology, *Tritium, Nitrates, Agricultural runoff, Groundwater quality, Management, Heavy water, Flow, *Monitoring, Water supply, Path of pollutants.
Identifiers: Southern Africa, Botswana, Kalahari, Yorkshire.

The measurement of tritium in rainwater over the past 20 years shows definite peaks during 1958-59 and 1964-65. The tritium concentration of water can be used as an accurate means of investigating water flow through acquifers and the recharge of groundwater by rainfall. (So African Water Info Center)
W77-10196

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
For primary bibliographic entry see Field 4B.
W77-10264

CONTRIBUTION OF LATERAL SOIL WATER MOVEMENT ABOVE A FRAGIPAN TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10312

METHOD FOR ROUGHLY ESTIMATING THE WATER EXCHANGE OF A RESERVOIR WITH AN AQUIFER HYDRAULICALLY CONNECTED WITH IT,
For primary bibliographic entry see Field 4B.
W77-10321

PROBLEMS OF HEAT STORAGE IN AQUIFERS,
Eidgenoessische Technische, Zurich (Switzerland). Institut fur Geophysik.
For primary bibliographic entry see Field 5B.
W77-10332

THE USE OF NATURAL TRITIUM FOR EVALUATING AQUIFER RECHARGE,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
G. B. Allison.
Water (Journal of the Australian Water and Wastewater Association), V. 4, No. 1, p 19-21, March 1977. 2 fig, 13 ref.

Descriptors: *Tritium, *Groundwater movement, *Natural recharge, Tracers, Radioisotopes, Groundwater recharge, Aquifers, Mathematical models, Reviews.

Inhomogeneities in aquifer materials often make regional estimates of aquifer parameters difficult or impossible to determine. Tritium is an ideal tracer for investigating water movement, as it is incorporated in the water molecule and moves very much as water does. The possibility thus arises of obtaining estimates, particularly of recharge rates, by studying the variation of tritium concentrations within the aquifer. To obtain quantitative information by this method, a historical record of tritium concentration in the recharge input sources is required, together with hydrogeological information to allow an approximate mathematical model of water movement to be developed. Appropriate models are reviewed, and their application to the determination of recharge rates described. (CSIRO)
W77-10372

HYDRAULIC DESIGN DATA FOR WATER WELLS IN UNCONSOLIDATED SEDIMENTS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W77-10377

EFFECTS OF SILTATION ON RATES OF RECHARGE,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
For primary bibliographic entry see Field 4B.
W77-10378

ANALYSIS OF THE MOVEMENT OF WATER FROM RECHARGE CHANNELS AND PITS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4B.
W77-10379

MATHEMATICAL MODELLING OF THE RETURN WATERS RUNOFF,
Laboratory of Mathematical Modelling of Hydrological Processes, Sarnigmi, Tashkent (USSR).
For primary bibliographic entry see Field 4B.
W77-10423

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.
M. Mirabzadeh.
In: Application of Mathematical Models in Hydrology and Water Resources System; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 168-175, 1975. 7 ref.

Descriptors: *Groundwater movement, *Potential flow, *Mathematical studies, *Model studies, Porous media, Flow, Equations, Mathematical models, Hydraulics, Analytical techniques, Dynamic programming, Equations, Mathematics, Foreign research.
Identifiers: *Iran, Three dimensional flow.

Dynamic programming was applied to three-dimensional flow problems in porous media. For this case, the inversion of the (L-1) matrix with the dimensions square of (MN) (L, M, and N are the numbers of nodes along space coordinates OX, OY, and OZ) becomes essential. If M and N are large, the method may result in difficulties concerning the accuracy of computations, memory storage, and/or computer time. For these reasons, the dynamic programming techniques, the hydrodynamical potential was solved for each layer of the porous media, and, with iteration on the layers, the value of the potential on each node in the flow region was determined. (See also Wk77-10419) (Humphreys-ISWS)
W77-10429

DISTRIBUTION OF NITRATE IN GROUND WATER, REDLANDS, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10558

CHARACTERISTICS OF AQUIFERS IN THE NORTHERN UINTA BASIN AREA, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah, Water Resources Div.
J. W. Hood.
Utah Department of Natural Resources Technical Publication No 53, 1976. 71 p, 23 fig, 3 plates, 6 tab, 42 ref, append.

Descriptors: *Aquifer characteristics, *Geohydrologic units, *Aquifer testing, *Hydrogeology, Hydraulic conductivity, Specific capacity, Specific yield, Transmissivity, Utah, Colorado, *Northern Uinta Basin.

Within the 5,200 square miles of the northern Uinta Basin area, the composite geologic section is about 58,000 feet thick. All but the uppermost 200 feet consists of consolidated rock. Only seven formations are considered to be important aquifers--unconsolidated glacial outwash and related deposits, the Duchesne River, Uinta, and Currant Creek Formations, the Glen Canyon Sandstone, Weber Quartzite, and rocks of Mississippian age. Eight other formations are considered to be important aquifers only in some areas. The remaining formations all contain water, but most have low permeability or degrade the chemical quality of water because of evaporite content. Hydraulic conductivity of unconsolidated deposits ranged from 2 to 1,800 feet per day; the average specific yield is estimated to be 0.10. In the consolidated rocks, horizontal hydraulic conductivity ranged from 0.000021 to 600 feet per day; the wide range results from the fracturing of rocks that have low primary permeability. Specific yields in the consolidated aquifers were estimated to range from 0.001 to more than 0.01. Rocks of Mississippian age have low permeability and store relatively little water, but they take in recharge through cavernous zones and deliver the water downdip and upward to younger formations through fracture zones. (Woodard-USGS)
W77-10559

LONGITUDINAL DISPERSION IN POROUS MEDIA WITH VARIABLE POROSITY,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
S. H. Lin.
Journal of Hydrology, Vol 34, No 1/2, p 13-19, July 1977. 3 fig, 13 ref.

Descriptors: *Porous media, *Porosity, *Dispersion, Aquifers, Groundwater, Saline water intrusion, Hydrology, Equations, Model studies, Mathematical studies, Oil reservoirs.
Identifiers: *Longitudinal dispersion, Variable porosity, Porosity equations, Coastal aquifers.

An analytical procedure was developed for predicting the solute dispersion in porous media with variable porosity and constant volumetric seepage flow rate. Several porosity equations, which may represent the possible porosity variation as a function of spatial coordinate, were suggested and used to test how well the predicted solute concentration using a constant average porosity is when compared to the prediction using a prescribed porosity function. It was found that the predictions by using an average porosity are within 15% of those predictions using a linear or a slightly curved porosity functions. However, the discrepancy between the two predictions is very substantial as the porosity function becomes a strong nonlinear one. For this instance, prediction of the solute concentration using an average porosity is rather poor, and a numerical method is needed if a reliable prediction is to be obtained. (Lee-ISWS)
W77-10659

A SIMPLE EFFECTIVE METHOD FOR THE COMPUTER SIMULATION OF GROUNDWATER STORAGE AND ITS APPLICATION IN THE DESIGN OF WATER RESOURCE SYSTEMS,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and M. J. Reeves.
Journal of Hydrology, Vol. 34, No. 1/2, p 77-96, July 1977. 10 fig, 3 tab, 18 ref.

Descriptors: *Groundwater, *Water storage, *Model studies, Storage, Underground storage, Aquifers, Seepage, Foreign research, Recharge, Foreign countries, Springs, Glacial drift, Infiltration, Sandstones, Baseflow, Flow, Streamflow, Rivers, Hydrology, *Simulation analysis, *Computer models.
Identifiers: *Groundwater models, *England.

The use of quasi-lumped parameter groundwater models in water resource system evaluation and design was described. Results were given of a range of applications which demonstrate the versatility of the technique. Examples were drawn from the Chalk of the River Hull catchment and from the Triassic sandstones in the Vale of York. (Sims-ISWS)
W77-10660

MODELING OF UNCONFINED GROUNDWATER SYSTEMS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering; and Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
W. A. Murray, and R. L. Johnson.
Ground Water, Vol. 15, No. 4, p 306-312, July-August 1977. 2 fig, 1 tab, 34 ref, 2 append.

Descriptors: *Groundwater, *Equations, *Model studies, Groundwater movement, Dupuit-Forchheimer theory, Mathematical models, Water table, Hydrology, Base flow.
Identifiers: *Unconfined groundwater systems, Polubarinova-Kochina, Unconfined groundwater flow, Groundwater hydrology.

Mathematical modeling of regional unconfined groundwater flow is accomplished most often by using a linearized Dupuit-Forchheimer (DF) equation. The depth of flow, h, in the general DF equation appears as a squared h term and also as a linear term of h. Linearization of the DF equation generally is accomplished with the first method of linearization presented by Polubarinova-Kochina (PK), in which squared h is replaced with h times some average depth of flow. The resulting equation is then linear in h. The second method of linearization described by PK is accomplished by replacing h with squared h, divided by an average flow depth, and hence the resulting equation becomes linear in squared h. If the second method of linearization is used, the same heat conduction type equation is obtained as that from the first method of linearization, but it tends to yield more accurate predictions of water table locations. Furthermore, by simply altering the numerical values of boundary condition constants, most existing mathematical models, based on the first method of linearization can be easily converted to yield solutions to the more accurate equation linearized by the second method. (Lee-ISWS)
W77-10661

ANALYTICAL SOLUTION FOR STEADY INTERFACE FLOW IN A COASTAL AQUIFER INVOLVING A PHREATIC SURFACE WITH PRECIPITATION,
Rijkswaterstaat, Rijswijk (Netherlands) Data Processing Div.
P. Van Der Veer.
Journal of Hydrology, Vol 34, No 1/2, p 1-11, July 1977. 6 fig, 14 ref.

Descriptors: *Saline water-freshwater interfaces, *Coasts, *Water table aquifers, Steady flow, Precipitation(Atmospheric), Mathematical models, Equations, Groundwater movement, Seepage, Darcys law, Flow nets, Boundary processes, Equilibrium.
Identifiers: *Ghyben-Herzberg relationship, Hydrostatic equilibrium, Hydraulic head.

The problem of determining the steady position of an interface and a phreatic surface in a coastal aquifer was investigated. Fresh groundwater flows towards the sea over salt groundwater which is at rest. The upper boundary of the flow region is a phreatic surface with precipitation. The analytical solution for this problem was a non-linear algebraic expression of complex parameters. Expressions for the position of the interface and the phreatic surface were given. The results were compared with the one-dimensional approach according to Badon Ghyben and Herzberg. For a special case of the general solution the interface as well as the phreatic surface forms a straight line. (Visocky-ISWS)
W77-10762

GROUND SUBSIDENCE DUE TO NONLINEAR FLOW THROUGH DEFORMABLE POROUS MEDIA,
Indian Inst. of Tech. Kanpur (India). Dept. of Civil Engineering.
M. R. Madhav, and P. Basak.
Journal of Hydrology, Vol 34, No 1/2, p 21-33, July 1977. 3 fig, 1 tab, 39 ref.

Descriptors: *Land subsidence, *Plastic deformation, *Groundwater movement, Aquifers, Porous media, Mathematical models, Equations, Artesian heads, Aquitards, Aqyucludes, Compaction, Effective stress, Void ratio, Compressibility, Pore pressure, Strain, Water level fluctuations.
Identifiers: Non-Darcy flow.

An analytical solution was presented for the problem of time rate of ground subsidence and piezometric pressure distribution caused by a sudden increase in the effective stress due to an instantaneous lowering of the groundwater table in an aquifer-aquitard-aquiclude system of finite thickness, obeying a nonlinear flow law of the type $v = Mi$ to the n power. Unlike for Darcian flow, the degree of subsidence and the nondimensional pore pressure distribution were found to be dependent on both the amount of groundwater fall and the thickness of the deforming medium. (Visocky-ISWS)
W77-10763

PUMP TESTING IN HETEROGENEOUS AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
A. Vandenberg.
Journal of Hydrology, Vol 34, Vol 1/2, p 45-62, July 1977. 12 fig, 1 tab, 11 ref, append.

Descriptors: *Aquifers, *Pump testing, *Model studies, Transmissivity, Groundwater, Hydrology, Drawdown, Equations, Theis equation, Wells.
Identifiers: *Finite-difference model, Pumped wells, Transmissivity distribution.

A finite-difference model of an infinite horizontal non-leaky aquifer was used to simulate a constant-rate pump test in a heterogeneous aquifer; the values of transmissivity specified for the nodes of the finite-difference grid were chosen at random from a uniform distribution over the interval 0-0.1 sq m/min and the ratio transmissivity/storativity was kept constant. The spacing of the finite-difference grid was 10 m in the vicinity of the pumped well at the center of the grid and became progressively wider towards the boundaries of the square area. The boundaries were located at a distance of 23 km from the well. Simulated time-drawdown curves for 624 nodes within 1,000 m of the well were analyzed using the Theis equation for drawdown in a infinite homogeneous aquifer and a least-squares technique to obtain the best values of transmissivity and storativity. Calculated transmissivities and storativities were distributed almost normally in a narrow range about the average of the values assigned to the nodes. Statistically, the pump tests yielded increasingly consistent results both as the observation node was removed farther and farther from the pumped well and as the points on the time-drawdown curve selected for the analysis represented later and later times. It was concluded that, at least for the type of hypothetical transmissivity distribution utilized, drawdown curves will not clearly reveal the inhomogenous nature of the aquifer. Thus, standard analytical aquifer-test techniques can be applied safely in such circumstances. (Lee-ISWS)
W77-10764

PERMISSIBLE MESH SPACING IN AQUIFER PROBLEMS SOLVED BY FINITE DIFFERENCES,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. M. Tomlinson.
Journal of Hydrology, Vol 34, No 1/2, p 63-76, July 1977. 6 fig, 4 tab, 12 ref, append.

Descriptors: *Aquifers, *Groundwater, *Model studies, Mathematical models, Finite element analysis, Groundwater movement, Analytical techniques, Computer models, Hydrology.
Identifiers: *Groundwater models, Mesh spacings, Finite-difference equations.

The maximum acceptable mesh spacing for finite-difference models of groundwater flow problems was investigated by analyzing a range of problems for which alternative solutions are available. It was shown that, for long time periods or for problems in which the head variation is smooth, a few mesh subdivisions are often acceptable; but for other problems, many mesh subdivisions are essential. Recommendations were given for the design of a mesh; the validity of the design was tested in the solution of two field problems. (Sims-ISWS)
W77-10765

COMPUTER MODELLING OF REGIONAL GROUNDWATER SYSTEMS IN THE CONFINED-UNCONFINED FLOW REGIME,
Department of the Environment, Reading (England). Central Water Planning Unit.
A. B. Birtles, and M. J. Reeves.
Journal of Hydrology, Vol 34, No 1/2, p 97-127, July 1977. 13 fig, 47 ref.

Descriptors: *Groundwater, *Groundwater movement, *Model studies, Mathematical models, Aquifers, Sandstones, Infiltration, Discharge(Water), Flow, Foreign research, Computer models, Recharge, Water levels, Pumping, Leakage, Hydrology.
Identifiers: *Groundwater models, *England, Finite-difference equations.

The concepts and philosophies underlying the development of general purpose computer programs for the simulation of groundwater flow in regional aquifer systems operating in the confined-unconfined flow regime were described. The most important of the many variables at play in such systems and the mechanisms by which they interact were identified, and the data required for the numerical definition of the hydrological system were reviewed. Emphasis was laid upon the importance of modelling physical processes as precisely as possible when computer predictions outside the scope of natural hydrological events are to be attemped. An example was given of an application of the computer programs and techniques to the investigation of a proposed river regulation scheme using groundwater abstractions. (Sims-ISWS)
W77-10766

INVESTIGATION OF THE HYDROLOGICAL BALANCE IN A PEAT SWAMP,
Brussels Univ. (Belgium).
F. DeSmedt, A. VanderBeken, and G. Demaree.
Journal of Hydrology, Vol 34, No 1/2, p 151-160, July 1977. 5 fig, 2 tab, 5 ref.

Descriptors: *Swamps, *Water levels, *Model studies, Mathematical models, Peat, Wetlands, Foreign countries, Groundwater movement, Water balance, Hydrology, Hydraulics.
Identifiers: *Belgium, *DeZegge Swamp(Belgium).

The soil of the bird sancturary 'DeZegge' consists of an alluvion layer over a peat layer. A hydrological balance of the area was constructed with the aid of weekly measurements of water or groundwater levels at several places in the swamp. In a first model, only horizontal groundwater flow in the alluvion layer was taken into consideration. The calibration of the model was executed with a linear regression. The model was strongly improved when vertical flow in and out of the peat layer was taken into account. The vertical flow was assumed to be proportional with the difference in hydraulic head. Again, linear regression was used to calibrate the model. In a third non-linear model, the flow in the peat was assumed to be non-Darcian. With pattern search, a non-linear optimization technique, it was shown that the model is not better than the foregoing model. (Sims-ISWS)
W77-10768

STATISTICAL APPLICATIONS IN GROUNDWATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
D. K. Sunada.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 20, Colorado State University, Fort Collins, p 20-1 - 20-17, 1976. 7 fig, 2 tab, 16 ref.

Descriptors: *Groundwater, *Porous media, *Statistical methods, *Model studies, Reviews, Groundwater movement, Aquifer characteristics, Monte Carlo method, Numerical analysis, Aquifer systems, Analytical techniques, Dispersion, Water tables, Physical properties, Permeability.

Traditionally, the applications of probabilistic statistic and stochastic methods have been oriented towards evaluation of microscopic properties of the flow and the physical properties of the porous medium. On a much larger scale, the analysis of a groundwater aquifer has been based primarily upon deterministic methods for solving the general differential equation describing the flow behavior. Temporal variables such as recharge to the aquifer and spatial variables such as permeability are usually treated in terms of 'averages', even if a sufficient sample size is not available to define these averages. The applications of statistics in the groundwater area reviewed were: (1) Evaluation of the microscopic behavior of flow through porous media, (2) Evaluation of data for use of groundwater systems, and, (3) Simulation of groundwater aquifers. (See also W77-10439) (Humphreys-ISWS)
W77-10789

2G. Water In Soils

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR, WATER, AND SOIL BY THERMAL ENERGY ANALYSIS: MEASUREMENTS IN BALTIMORE, MD.,
Thermo Electron Research Center, Waltham, Mass.
For primary bibliographic entry see Field 5A.
W77-10129

HYDRODYNAMIC DISPERSION IN POROUS MATERIALS,
Agricultural Research Council, Littlehampton (England). Glasshouse Crops Research Inst.
D. A. Rose.
Soil Science, Vol 123, No 5, p 277-283, May 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Dispersion, *Hydrodynamics, *Tracers, *Porous media, Diffusion, Convection, Mathematical models, Equations, Curves, Theoretical analysis, Porosity, Aggregates.
Identifiers: *Superposition, Breakthrough curves, Pulse input, Periodic input, Dimensionless parameters, Peclet number.

Some aspects are considered of the hydrodynamic disperison of tracer which occurs under the combined influence of molecular diffusion and convection when a fluid flows through a finite column of porous material. In particular, the paper discussed (1) the use of the principle of superposition to obtain breakthrough curves for pulsed and

periodic inputs of tracer, (2) the form of dispersion coefficients in terms of dimensionless groups of parameters, and (3) the mechanisms underlying dispersion. (Visocky-ISWS)
W77-10131

EFFECT OF ANTECEDENT CONDITIONS ON FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2C.
W77-10175

RELATION OF CLIMATE TO LEACHING OF SOLUTES AND POLLUTANTS THROUGH SOILS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W77-10187

THE RELEASE OF NITROGEN FROM SULFUR-COATED UREA AS AFFECTED BY SOIL MOISTURE, COATING WEIGHT, AND METHOD OF PLACEMENT,
Woods (M. J.) and Associates, Dublin (Ireland).
M. Prasad.
Soil Science Society of America Journal, Vol. 40, No. 1, p 134-136, January-February 1976. 5 tab, 13 ref.

Descriptors: *Nitrogen, *Ureas, *Soil moisture, Calcareous soils, Soil investigations, Nitrification, Nitrite, Volatility.
Identifiers: Ammonia volatilization, Sulf-coated urea.

Information on the release of N from sulfur-coated urea (SCU) as affected by soil moisture in the aerated range is lacking. Laboratory incubation experiments were therefore conducted on two soils to study the release of N from SCU as affected by soil moisture in the aerated range, coating weight (SCU-28 and SCU-9), and method of placement (In one soil only). In the calcareous Princes Town soil the release of N from SCU increased with increasing moisture throughout the 9 weeks of study. In acid Talparo soil similar trends were present up to 3 weeks, but at 6 and 9 weeks maximum release of N occurred at medium moisture (soil moisture at pF 2.4) and minimum release at low moisture (soil moisture at pF 3.5). (Skogerboe-Colorado State).
W77-10270

THE RESISTANCE OF INTACT MAIZE ROOTS TO WATER FLOW,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
H. B. So, L. A. G. Aylmore, and J. P. Quirk.
Soil Science Society of America Journal, Vol. 40, No. 2, p 222-225, March-April 1976. 2 fig, 3 tab, 9 ref.

Descriptors: *Tensiometers, *Root systems, Soil water, *Soil water movement, *Corn(Field), Instrumentation.
Identifiers: Root tissue.

Using a novel tensiometer-potometer system the relationship between the root resistance to water flow of maize and the water potential of the root tissue has been examined. Over the range of water potentials used a linear relation has been observed in contrast to previous observations. Calculations using published data indicate that the rhizosphere resistance is of the same order of magnitude as the root resistance when the soil moisture potential of the rhizosphere is about -1 to -2 bars. (Skogerboe-Colorado State)
W77-10271

DENITRIFICATION KINETICS IN SOIL SYSTEMS: THE SIGNIFICANCE OF GOOD FITS OF DATA TO MATHEMATICAL FORMS,
Washington Univ., St. Louis, Mo. Dept. of Biology.
D. H. Kohl, F. Vithayathil, P. Whitlow, G. Shearer, and S. H. Chien.
Soil Science Society of America Journal, Vol. 40, No. 2, p 249-253, March-April 1976. 5 fig, 10 ref.

Descriptors: *Denitrification, *Kinetics, Soils, Soil properties, Saturation, *Illinois, *Nitrogen.
Identifiers: Glucose.

The loss of NO3(-) added to two central Illinois soils was determined in experiments in which the soils were incubated under waterlogged conditions. The loss was measured as a function of substrate concentration in one experiment in which samples were incubated for a single time (24 hours) and as a function of time in a second experiment in which the concentration of the added NO3(-) was held constrant (200 ppm NO3(-) -N). The rate of loss of NO3(-) was about 5.5 times higher in one of the soils than in the other. This difference was largely overcome by the addition of glucose (1% with respect to the soil) which also greatly enhanced the rate of denitrification in both soils. The experimental points representing the rate of NO3(-) loss plotted as a function of the concentration of added NO3(-), were equally well fit by Michaelis-Menten and expotential equations as well as by the solution to a pair of nonlinear differential equations representing a system in which the product of one reaction is a substrate in a second sequence. (Skogerboe-Colorado State)
W77-10272

AN EVALUATION OF JOB'S METHOD OF CONTINUOUS VARIATIONS AS APPLIED TO SOIL ORGANIC MATTER-METAL ION INTERACTIONS,
Georgia Univ., Athens. Dept. of Chemistry.
P. McCarthy, and H. B. Mark, Jr.
Soil Science Society of America Journal, Vol. 40, No. 2, p 267-276, March-April 1976. 5 fig, 31 ref.

Descriptors: *Organic matter, *Ions, *Soil chemistry, Soil properties, Soil investations, *Metals, Absorption, *Methodology, Evaluation.
Identifiers: *Soil organic matter, *Job's method.

The literature dealing with the application of Job's method of continuous variations to the study of soil organic matter-metal ion interactions has been reviewed, and an introduction to the fundamental chemistry necessary for an understanding of these interactions is presented. The method of continuous variations was applied to simple systems consisting of metal ions and mixtures of discrete ligands. The behavior of these 'model' systems was compared to that of the more complicated soil organic matter systems. Following a consideration of the fundamental principles of job's method and of its boundary conditions and limitations, it was concluded that this method is not directly applicable to the study of soil organic matter-metal ion interactions. This conclusion was substantiated by experiments carried out on the simple 'model' systems as well as those on fulvic acid itself. Explanations are proposed to account for the deceptive results which were obtained when this method was erroneously applied by other workers to the investigation of soil organic matter-metal ion interactions in the past. Possible interferences, due to scattering of light, during the study of soil organic matter-metal ion reactions by UV-visible absorption spectroscopy are considered. (Skogerboe-Colorado State)
W77-10273

INFLUENCE OF SOIL PH ON THE AVAILABILITY OF ADDED BORON,
Wisconsin Univ., Madison. Dept. of Soil Science; and Wisconsin Univ., Madison. Dept. of Horticulture.
L. A. Peterson, and R. C. Newman.
Soil Science Society of America Journal, Vol. 40, No. 2, p 280-282, March-April 1976. 1 fig, 3 tab, 13 ref.

Descriptors: *Boron, Fescue, Soil properties, Greenhouses, *Soil chemistry, Soils, Soil investigations, Hydrogen ion concentration.
Identifiers: Herbage yields.

A Plano silt loam with five relatively constant pH levels (4.7, 5.3, 5.8, 6.3, 7.4) was used to study the influence of soil pH on the availability of added B. A greenhouse study was conductedusing tall fescue with five soil pH levels, and four rates of applied B essentially equivalent to 0. 5, 10, and 20 kg/ha, and five herbage harvests. Herbage yields of tall fescue were not affected by either soil pH or B treatments; however, tissue B concentrations ranged from 8 to 739 ppm for the five harvests. Boron uptake by tall fescue was relatively uniform for soil pH levels of 4.7, 5.3, 5.8, and 6.3 within each level of B availability. Recovery percentages of 30 to 50% of the added B by five cuttings of forage indicate a soil fixation of B. Highest recovery percentage was associated with the highest rate of added B. A 2.5-fold drop in B uptake occurred at pH 7.4 as compared with the other soil pH levels indicating substantial fixation of B. Hot-water-soluble B content of the soil generally increased with an increase in pH and with added B. The soluble B test did not predict the low recovery of B at pH 7.4 (Skogerboe-Colorado State)
W77-10274

PHOSPHORUS SORPTION AND DESORPTION CHARACTERISTICS OF SOIL AS AFFECTED BY ORGANIC RESIDUES,
Idaho Univ., Moscow. Dept. of Plant and Soil Sciences.
B. B. Singh, and J. P. Jones.
Soil Science Society of America Journal, Vol 40, No 3, p 389-394, May-June 1976. 7 fig, 1 tab, 31 ref.

Descriptors: *Phosphorus, *Sorption, *Organic matter, Soils, Soil investigations, Soil properties, Alfalfa, Beans, Barley, Farm wastes, Mineralization, Fertilizers, Fertilization.
Identifiers: Desorption.

The influence of seven organic residues on sorption and desorption of P by a high P-fixing soil was determined after 30, 75, and 150 days of incubation. After incubating for 30 days, all residues decreased the amount of P sorbed by the soil, resulting in higher equilibrium solution P levels. However, after incubating for either 75 or 150 days, the P content of the organic residues had a marked influence on sorption of added P and desorption of sorbed P. The critical value of P in organic residues which resulted in no tie-up of soil P was 0.3%. Sawdust, wheat straw, and cornstalks which contained < 0.3% P decreased labile soil P and increased sorption by soil after incubating for 75 or 150 days. Alfalfa, barley, beans, and poultry manure that contained P in excess of 0.3% decreased sorption of P. The results suggest that P fertilizer rates estimated from sorption isotherms may need to be modified following addition of organic residues. (Skogerboe-Colorado State)
W77-10275

EXCHANGE AND HYDRATION PROPERTIES OF CU(2+) ON MIXED-ION NA(+) - CU(2+) SMECTITES,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
M. B. McBride.
Soil Science Society of American Journal, Vol 40, No 3, p 452-456, May-June 1976. 4 fig, 1 tab, 20 ref.

Descriptors: *Cation adsorption, *X-ray diffraction, Clays, Montmorillonite, Soils, Soil investigations, Soil properties, Soil chemistry, *Ion exchange, Ions, *Copper, *Sodium, *Hydration.

The exchange of Na(+)-montmorillonite with Cu(2+) was studied using X-ray diffraction, electron spin resonance (ESR) and a specific Cu(2+) electrode in order to investigate the hydration and exchange properties of mixed Cu(2+) - Na(+) clay systems. With < 30% of the exchange sites occupied by Cu(2+), the clays behave much as pure Na(+)-montmorillonite and swell freely in water. Larger exchange levels of Cu(2+) produce more ordered interlayers at low relative humidities. At high relative humidities, this ordered structure is reduced and a solution-like environment is produced as the aluminosilicate sheets further separate. Exchange isotherms demonstrate a large preference for Cu(2+) over Na(2+) at low Cu(2+) exchange levels but preference for Na(+) at high Cu(2+) levels. In contrast, Cu(2+) - Mg(2+) exchange does not show this effect, indicating that certain exchange sites on the silicate structure preferentially adsorb divalent cations. Thus, Cu(2+) ions are effectively removed from solution by Na(+)-monmorillonite, but are not adsorbed in preference to other divalent cations. (Skogerboe-Colorado State)
W77-10276

POTASSIUM RELEASE FROM SAND, SILT, AND CLAY SOIL SEPARATES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
D. A. Munn, L. P. Wilding, and E. O. McLean.
Soil Science Society of America Journal, Vol 40, No 3, p 364-366, May-June 1976. 6 tab, 10 ref.

Descriptors: Soils, Soil investigation, *Potassium, Soil texture, Soil properties, *Soil chemistry, Nutrients, Soil chemical properties, Particle size, *Clays.
Identifiers: *Soil separates.

Four Ohio soils of divergent mineralogy were fractionated into sand, silt, and clay-sized separates after dispersion with an ultrasonic probe. Samples were extracted for 10 days with 0.01M CaCl2 with the solution being changed each day. There was a wide range in daily and cumulative K release among the four soils for the same particle size and for different particle sizes within the same soil. When weighted according to particle size distribution of the soil, the clay was found to contribute 30-74%; silt 24-56%; and sand 3-21% of the total K released by the sum of the three separates. In all four soils, the clay separate released the most K per unit weight. The apparent rate constants for K release from the sand and clay separates were similar and generally higher than that for the silt separates. (Skogerboe-Colorado State)
W77-10277

THEORETICAL CONSIDERATION ON NITRITE SELF-DECOMPOSITION REACTIONS IN SOILS,
Ghent Rijksuniversiteit (Belgium). Lab. of Physical and Radiobiological Chemistry.
O. Van Cleemput, and L. Baert.
Soil Science Society of America Journal, Vol 40, No 1, p 322-324, March-April 1976. 3 fig, 10 ref.

Descriptors: Soils, Soil investigations, Soil properties, *Nitrites, Reactions, *Degradation(Decomposition).
Identifiers: Reaction equilibrium, *Nitrous acid.

The spontaneity of different nitrous acid self-decomposition reactions was calculated for different sets of activities of the participating components at pH 4, 7, and 9. These calculations showed that nitrous acid preferentially decomposes spontaneously to NO and NO3(-) instead of self-decomposition to NO and NO2 or N2O4. The higher the pH the larger the region of nitrous acid stability. Theoretical evidence for the reaction of nitrous and nitric acid with formation of NO2 was obtained. (Skogerboe-Colorado State)
W77-10279

A TECHNIQUE TO DETERMINE IRON EFFICIENCY IN PLANTS,
Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
J. C. Brown, and W. E. Jones.
Soil Science Society of America Journal, Vol. 40, No. 3, p 398-405, May-June 1976. 6 fig, 3 tab, 16 ref.

Descriptors: *Iron, *Crop response, *Fertilization, *Soil tests, Soil investigations, Nutrients, Crop production, Plant growth.

Soil tests should predict crop response to fertilization. In the case of Fe, plant factors seem to affect the use of Fe by the plant; thus, soil tests may not be reliable. Use of soil Fe by plants is genetically controlled by an adaptive mechanism which is activated in Fe-efficient plants in response to Fe-stress, but remains inactive if Fe is sufficient. Fe-inefficient plants develop less Fe-stress response than Fe-efficient plants. Using this range of Fe-stress response in plants as a basis, a technique was developed to screen plants for Fe efficiency. A limited supply of Fe and some control of pH in the growth medium were required in this technique. The pH was controlled by using nutrient solutions, N only as NO3, and N as NH4 and NO3, and by varying the CaCO3 and P concentrations in the solutions. The optimum supply of Fe (0.2 mg Fe/liter) was determined by growing the plants at different Fe concentrations. (Skogerboe-Colorado State)
W77-10280

CORRELATION OF PLANT MANGANESE WITH EXTRACTABLE SOIL MANGANESE AND SOIL FACTORS,
Minnesota Univ., Waseca. Southern Experiment Station.
G. W. Randall, E. E. Schulte, and R. B. Corey.
Soil Science Society of America Journal, Vol. 40, No. 2, p 282-287, March-April 1976. 6 tab, 19 ref.

Descriptors: *Manganese, Soils, Soil properties, *Soil chemical properties, Oats, *Organic matter, Greenhouses, Soil investigations, *Wisconsin, Soil chemistry.
Identifiers: Ryegrass.

The availability of Mn on 37 low and 20 high organic matter in Wisconsin soils was determined by growing oats and ryegrass, respectively, in consecutive greenhouse studies. The Mn uptake values were used to develop prediction equations by means of multiple regression analysis with Mn extracted by various extracting solutions (18 extractants for the low and 13 for the high organic matter soils) plus various functions of soil pH and organic matter as the independent variables. On the low organic matter soils (O.M. < 6%), using only the Mn test, the best prediction values with uptake were obtained with total Mn, and with the 0.1N H3PO4 and 0.01M EDTA in 1N NH40Ac extractants (sq R=57, 50 and 49%, respectively). Inclusion of soil pH and organic matter with the soil test values resulted in Mn uptake being predicted best by the 0.01M and 0.05M EDTA extractants (sq R=68% for both). The contribution of the soil test in the prediction equation was strongest when the 0.1N H3PO4, 0.01M EDTA in 1N NH40Ac, 0.05M EDTA or DTPA (pH7.3) extractants were used. (Skogerboe-Colorado State)
W77-10281

INFLUENCE OF SALT AND ALKALI ON IONIC EQUILIBRIA IN SUBMERGED SOILS,
International Rice Research Inst., Los Banos, Laguna (Philippines).
N. S. Pasricha, and F. N. Ponnamperuma.
Soil Science Society of America Journal, Vol. 40, No. 3, p 374-376, May-June 1976. 4 tab, 15 ref.

Descriptors: *Salts, Salinity, *Alkali, *Clays, Sodium, Sampling, Ions, Iron, Manganese, Soils, *Soil investigations, Soil properties.
Identifiers: Exchangeable sodium.

To clarify the effects of salt and alkali on Fe(2+) and Mn(2+) equilibria in submerged soils, Maahas clay (a Haplustalf) was amended with NaCl and NaHCO3 to give initial electrical conductivities of 5, 10, 20, and 25 mmhos/cm at 25C and exchangeable Na percentages of 5, 10, 15, 20, and 25, respectively. The amended soils and an untreated control were kept submerged in 16-liter pots in a greenhouse at 25-30C. The soil solutions, drawn anoxically by gravity, were analyzed fortnightly for Eh, pH, CO2, and the major ions. As the salt level increased, pH decreased and the concentrations of all cations increased. As alkalinity increased, the concentrations of all cations except K(+) and Na(+) decreased. In spite of wide variations in pH, Eh, ionic strength, and the concentrations of Fe(2+) and Mn(2+) in the soil solutions, the values of the expressions, pE - pFe(2+) + 3 pH, pE - 1.5 pFe(2+) + 4 pH, pE + pH, and pH - 0.5 pMn(2+) - 0.5 pCO2 were nearly equal to 17.9, 23.3, 7.3, and 4.1, respectively, indicating that even in the salt and alkali treated soils, the Fe(OH)3-Fe(2+) and Fe3(OH)8-Fe(2+) systems controlled the solubility of Fe(2+) while the MnCO3-H2O-CO2 system regulated the solubility of Mn(2+). (Skogerboe-Colorado State)
W77-10282

AN EVALUATION OF SULFUR-COATED UREA AS A PREPLANT TOTAL SEASON NITROGEN SUPPLY FOR TRELLISED TOMATOES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W77-10283

ZINC ADSORPTION ISOTHERMS FOR SOIL CLAYS WITH AND WITHOUT IRON OXIDES REMOVED,
Georgia Univ., Athens. Dept. of Agronomy.
L. M. Shuman.
Soil Science Society of America Journal, Vol. 40, No. 3, p 349-352, May-June 1976. 2 fig, 3 tab, 16 ref.

Descriptors: *Zinc, *Adsorption, *Georgia, *Clays, Soils, Soil properties, *Iron oxides, Soil investigations.

The clay fraction from four predominant Georgia soils sampled at two depths was separated and the iron oxides removed from a portion of each clay sample. These clays were equilibrated with five Zn solutions to measure Zn adsorption. The data conformed to the Langmuir adsorption isotherm. Langmuir coefficients were used to evaluate the Zn adsorptive capacities of the clays and the bonding energies for Zn. Adsorptive capacities and CEC values for the clays from Decatur cl and Leefield is soils were higher than those for clays from the Cecil sl and Norfolk ls soils. Differences in adsorptive capacities were not consistent between depths nor between samples with or without Fe oxides. However, removal of the Fe oxides increased the capacity to adsorb Zn in more instances than it decreased this capacity. Zinc adsorptive capacities were directly related to the CEC values for the clays. When comparing those samples with and without Fe oxides removed, bonding energies were inversely related to adsorptive capacities. (Skogerboe-Colorado State)
W77-10284

INFLUENCE OF ROW SPACING AND STRAW MULCH ON FIRST STAGE DRYING,
Agricultural Research Service, Temple, Tex. Southern Region.
For primary bibliographic entry see Field 2D.
W77-10286

GASEOUS LOSS OF AMMONIA FROM SULFUR-COATED UREA, AMMONIUM SULFATE, AND UREA APPLIED TO CALCAREOUS SOIL (PH 7.3),
Woods (M. J.) and Associates, Dublin (Ireland).

M. Prasad.
Soil Science Society of America Journal, Vol. 40, No. 1, p 130-134, January-February 1976. 7 tab, 20 ref.

Descriptors: *Ureas, Nitrogen, Temperature, Calcareous soils, Soil moisture, *Ammonia, Nutrients, *Sulfates, Pollutant identification, Water pollution.
Identifiers: *Sulfur-coated ureas.

Laboratory incubation experiments were conducted to study the comparative volatilization loss of NH3 in a calcareous soil from sulfur-coated urea (SCU) with fast (F), medium (M), and slow (S) dissolution rates, ammonium sulfate (AS) and urea, at two temperatures 22 and 32C, and at three soil moisture levels 25, 50, and 80% of the water holding capacity of the soil. The effect of the addition of organic amendment (filter press mud) to soil on NH3 loss from these N-sources was also studied. Losses were studied up to 21 days. At both temperatures increasing soil moisture levels led to reduction of NH3 loss regardless of the N-source, despite the fact that the soil analysis showed higher dissolution of N from SCU at high soil moisture. (Skogerboe-Colorado State)
W77-10287

A COMPARISON OF NUMERICAL SIMULATION MODELS FOR ONE-DIMENSIONAL INFILTRATION,
Universite Scientifique et Medicale, Grenoble (France). Institut de Mecanique.
R. Haverkamp, M. Vauclin, J. Touma, P. J. Wierenga, and G. Vachaud.
Soil Science Society of America Journal, Vol. 41, No. 2, p 285-294, March-April 1977. 6 fig, 4 tab, 34 ref, 1 append.

Descriptors: *Model studies, *Mathematical models, *Infiltration, Numerical analysis, Soil water movement, Soils, Sands, Clays, Profiles, Moisture content, Hydraulic conductivity, Computer models, Equations, Soil science, Simulation analysis.

Six models, employing different ways of discretization of the nonlinear infiltration equation, were compared in terms of execution time, accuracy, and programming considerations. All models yielded excellent agreement with water content profiles measured at various times in a sand column. The two explicit models, the theta-based CSMP model and the h-based explicit model, used between 5 and 10 times more computer time than the implicit models. Results obtained with the two models which used the Kirchhoff integral transformation were no better than results obtained with the two h-based implicit models. The implicit schemes with implicit or explicit evaluation of the hydraulic conductivity and water capacity functions appear to have the widest range of applicability for predicting water movement in soil with both saturated and nonsaturated regions. Excellent agreement was obtained among water content distributions, infiltration rates, and cumulative infiltration volumes calculated with the implicit finite difference model and with Philip's quasi-analytical solution. (Sims-ISWS)
W77-10310

LATERALLY CONFINED, STEADY FLOWS OF WATER FROM SOURCES AND TO SINKS IN UNSATURATED SOILS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
P. A. C. Raats.
Soil Science Society of America Journal, Vol. 41, No. 2, p 294-304, March-April 1977. 8 fig, 36 ref.

Descriptors: *Soil water movement, *Irrigation, *Model studies, Mathematical models, Soils, Unsaturated flow, Subsurface irrigation, Equations, Agriculture.
Identifiers: *Lateral flow, Plane flow, Axisymmetric flow.

The application of water along lines and at points is of interest in connection with furrow, subsurface, and drip irrigation. The removal of water along lines and at points is of interest in connection with uptake of water by plant roots and a variety of devices used to extract water and measure fluxes in the laboratory and in the field. Laterally confined, steady flows from line and point sources at arbitrary distances below the soil surface and to line and point sinks at arbitrary distances above an impermeable base were analyzed on the basis of the assumption that the hydraulic conductivity is an exponential function of the pressure head. The results included expressions describing the flow pattern, the distribution of the components of the flux, and the distributions of matric flux potential, pressure head, water content, and total head. The horizontal variations were described by trigonometric functions in problems involving line sources and sinks and by Bessel functions in problems involving point sources and sinks. The regions below and above the sources and sinks were treated separately, subject, of course, to matching along the interface between the two regions. The vertical variations were described by exponential dampings and by surface and base reflections. For the flows to sinks, with each flow pattern there is associated an infinite variety of distributions of the matric flux potential, etc., corresponding to different suctions applied at the sinks. Some problems involving partial supply by sources and interception by sinks also were treated. (Sims-ISWS)
W77-10311

CONTRIBUTION OF LATERAL SOIL WATER MOVEMENT ABOVE A FRAGIPAN TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa. Dept. of Agronomy.
W. E. Palkovics, and G. W. Petersen.
Soil Science Society of America Journal, Vol. 41, No. 2, p 394-400, March-April 1977. 7 fig, 2 tab, 31 ref.

Descriptors: *Soil water movement, *Streamflow, *Perched water, Groundwater, Groundwater movement, Subsurface waters, Base flow, Streams, Wells, Observation wells, Drainage, Hydraulic conductivity, Water balance, Water table, Hydrology.
Identifiers: *Lateral flow.

A water balance approach to the hydrologic budget on a small mountainous watershed in central Pennsylvania was used to determine if lateral water flow perched above a soil fragipan could be quantitatively related to streamflow. Perched water table fluctuations were measured using a grid of 60 observation wells, and streamflow was recorded using a weir. The site was monitored in mid-November when evapotranspiration was at a minimum and when no precipitation was recorded. Soil water yield due to perched water table decline was calculated, hydraulic conductivity and the rate of water movement through the soil computed, and the zone of water contribution to streamflow determined. Results indicated that water yield from the soil aquifer explained streamflow. Saturated water flow was shown to be the main mechanism of water movement, although unsaturated flow may have been significant for short distances under low tensions. The major zone of soil water contribution to streamflow was the more poorly drained soils adjacent to the stream. Unsaturated soils on the upper mountain flanks had little effect upon streamflow because of low gradient and large distance from the stream. (Sims-ISWS)
W77-10312

WATER MOVEMENT THROUGH PEDAL SOILS: I. SATURATED FLOW,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. L. Anderson, and J. Bouma.
Soil Science Society of America Journal, Vol. 41, No. 2, p 413-418, March-April 1977. 4 fig, 4 tab, 24 ref. EPA R802874.

Descriptors: *Soil water movement, *Saturated flow, *Clay loam, Hydraulic conductivity, Dispersion, Soils, Laboratory tests, Tracers, Chlorides, Soil structure, Groundwater, Groundwater movement, Hydrodynamics, Soil science.
Identifiers: *Pedal soils, Hydrodynamic dispersion, Breakthrough curves.

Apparent dispersion coefficients were determined with a chloride tracer in 55-cm long undisturbed columns from four pedal soil horizons of three pedons. Five medium subangular blocky structures were compared with five coarse prismatic structures, all with a silty clay loam texture. Dispersion coefficients (D), which could not always be calculated due to 'nonideal' behavior to the flow system, were significantly different for the two types of structures. Application of an unlimited quantity of traced water to drained columns resulted in very high dispersion, particularly for the subangular blocky structures. Some practical implications of the occurrence of hydrodynamic dispersion were discussed. (See also W77-10314) (Sims-ISWS)
W77-10313

WATER MOVEMENT THROUGH PEDAL SOILS II. UNSATURATED FLOW,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. L. Anderson, and J. Bouma.
Soil Science Society of America Journal, Vol. 14, No. 2, p 419-423, March-April 1977. 6 fig, 4 tab, 7 ref. EPA R802874.

Descriptors: *Soil water movement, *Unsaturated flow, *Clay loam, Hydraulic conductivity, Dispersion, Soils, Laboratory tests, Tracers, Chlorides, Soil structure, Groundwater, Groundwater movement, Hydrodynamics, Soil science.
Identifiers: *Pedal soils, Hydrodynamic dispersion, Breakthrough curves.

Very high hydrodynamic dispersion, occurring during application of an unlimited dose of chloride-traced water to 10 drained 55-cm long columns with undisturbed pedal soils, was strongly reduced by a daily application of 1 cm of water. Dispersion in five columns with subangular blocky structures remained significantly higher than that measured in five columns with prismatic structures. Differences were explained by a hypothetical analysis of flow patterns in both types of structure. Application of a surface crust strongly reduced dispersion in the subangular blocky structures, even though the flow rate remained approximately 1 cm/day. This was attributed to lack of flow into the larger vertical pores extending through the columns. Pronounced differences in terms of hydrodynamic dispersion were found between two types of structures from three soil series, all with a silty clay loam texture, thereby demonstrating the potential usefulness of routine soil structure descriptions as a correlative tool for predicting certain aspects of physical behavior. (See also W77-10313) (Sims-ISWS)
W77-10314

SOIL AERATION,
Edinburgh Univ. (Scotland). School of Agriculture.
K. A. Smith.
Soil Science, Vol. 123, No. 5, p 284-291, May 1977. 4 fig, 49 ref.

Descriptors: *Soil gases, *Aeration, *Diffusion, *Soil aggregates, Anaerobic conditions, Soil structure, Size, Gradation, Climates, Compacted soils, Cultivation, Drainage, Denitrification, Theoretical analysis, Oxygen, Nitrogen, Equations, Mathematical models, On-site investigations, Air pollution effects.
Identifiers: Ethylene.

Recent models of gaseous diffusion in soils have taken account of the effects of soil structure, and have explained the development of anaerobic zones within aggregates. Aggregate sizes commonly fit log-normal distributions. In clayey soils, anaerobic conditions persist for long periods in the larger aggregates, but quantitative assessment of anaerobic volumes is complicated by uncertainty about the value of the diffusion coefficient for oxygen in wet soils. Methods of measuring soil aeration and the results of field studies were reviewed. It was concluded that climatic factors have more effect than cultivation or compaction, and drainage produces little improvement in the heaviest soils. Under these conditions considerable losses of nitrogen occur by denitrification, and significant concentrations of physiologically active compounds such as ethylene are released. (Visocky-ISWS)
W77-10325

HERBICIDE TRANSPORT IN SOIL UNDER CENTER PIVOT IRRIGATION SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W77-10366

TRANSPORT OF NITRATE ION IN UNSTEADY, UNSATURATED FLOW IN POROUS MEDIA,
Texas Univ. at Austin. Dept. of Chemical Engineering.
M. A. Hildebrand, and D. M. Himmelblau.
AIChE Journal, Vol 23, No 3, p 326-335, May, 1977. 8 fig, 1 tab, 39 ref.

Descriptors: *Ion transport, *Nitrates, *Leaching, *Infiltration, *Mathematical models, Water pollution sources, Time, Flow rates, Chemical properties, Waste disposal, Movement, Waste water treatment.

A simplified model of nitrate ion transport was described for unsteady, unsaturated flow in porous media. The model was used to gain information on the pollution of ground and surface waters, especially through leaching and infiltration. The water content of the sand and the nitrate ion concentrations in the water phase were important variables. They had to be measured for less than saturated flow. Model-based predictions were compared to data on nitrate movement in sand columns. Profiles of nitrate concentrations as a function of time and distance showed good agreement with model-based data. The nitrate dispersion front velocity and the nitrate dispersion coefficient proved to be functions of time and flow rate. A correlation was developed between the nitrate dispersion coefficient and cumulative average seepage velocity. This allowed application of the model to media other than sand. The agreement between predicted values of the nitrate concentration and the experimental values was found satisfactory when subjected to an F test. (Collins-FIRL)
W77-10595

LONGITUDINAL DISPERSION IN POROUS MEDIA WITH VARIABLE POROSITY,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W77-10659

USE OF LABORATORY EXTRACTION DATA TO PREDICT LOSSES OF DISSOLVED INORGANIC PHOSPHATE IN SURFACE RUNOFF AND TILE DRAINAGE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-10734

DETERMINATION OF INORGANIC PHOSPHORUS IN OXALATE EXTRACTS OF SOILS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-10797

2H. Lakes

GRAVITATIONAL OSCILLATIONS OF LAKE HURON, SAGINAW BAY, GEORGIAN BAY, AND THE NORTH CHANNEL,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
D. J. Schwab, and D. B. Rao.
Journal of Geophysical Research, Vol. 82, No. 15, p 2105-2115, May 20, 1977. 12 fig, 3 tab, 16 ref.

Descriptors: *Seiches, *Lake Huron, *Great Lakes, *Model studies, Mathematical models, On-site investigations, Water levels, Lakes, Data processing, Analytical techniques, Limnology.
Identifiers: *Gravitational oscillations, *Lake oscillations, Power spectra, Oscillation modes.

Periods and structures of gravitational free oscillations in Lake Huron, Saginaw Bay, Georgian Bay, and the North Channel were determined from theoretical calculations. The calculations took into account the bathymetry and shape of the Huron system and also the effect of the earth's rotation. Time series analyses were performed on water level data from 13 stations around the lake. The power and coherence spectra exhibited peaks corresponding to diurnal and semidiurnal forcing and various modes of free oscillation of the lake. Both theory and observations showed that Saginaw Bay, Georgian Bay, and the North Channel each have a fundamental frequency of oscillation lower than the frequency of Lake Huron's first longitudinal oscillation. There was reasonable agreement between theoretical and observed characteristics for several of the free modes of the Lake Huron system. (Sims-ISWS)
W77-10109

EFFECT OF WIND AND RAIN ON SURFACE REAERATION,
Universidad Nacional Autonoma de Mexico Inst. of Engineering.
R. B. Banks, and F. F. Herrera.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE3, Proceedings Paper No. 13013, p 489-504, June 1977. 9 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Reaeration, *Rainfall intensity, *Dissolved oxygen, *Aeration, Winds, Analysis, *Lakes, Turbulence, Mixing, Diffusion, *Lagoons, Raindrops.
Identifiers: *Oxygen transfer, *Aeration coefficients.

Much information is now available to determine the surface reaeration coefficient in rivers and estuaries. In contrast, not much is yet known about the magnitude of this coefficient in lakes and lagoons. Some studies indicate that wind action is important in establishing the rate of oxygen transfer across the surface of a lake or lagoon. In addition, it appears that the effect of rainfall may be important in reaeration in some lakes. In the present study, analyses were made of the effects of wind and rain on reaeration. Expressions were developed relating the rate and power of a rainfall to the surface reaeration coefficient. It also was determined that the direct addition of oxygen from oxygen-saturated raindrops can be an important factor in reaeration. (Adams-ISWS)
W77-10115

EFFECTS OF ACID PRECIPITATION ON A SMALL ACID LAKE IN SOUTHERN NORWAY,
Norsk Institutt for Vannforskning, Blindern.
For primary bibliographic entry see Field 5B.
W77-10127

SOME EFFECTS OF AGRICULTURAL DEVELOPMENT AND FLUCTUATIONS IN WATER LEVEL ON THE PHYTOPLANKTON PRODUCTIVITY AND ZOOPLANKTON OF A NEW ZEALAND RESERVOIR,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10137

EFFECTS OF ARTIFICIALLY INTRODUCED GROUND WATER ON THE CHEMICAL AND BIOCHEMICAL CHARACTERISTICS OF SIX HILLSBOROUGH COUNTY (FLORIDA) LAKES,
University of South Florida, Tampa. Dept. of Chemistry.
D. F. Martin, D. M. Victor, and P. M. Dooris.
Water Research, Vol. 10, No. 1, p. 65-69, 1976. 2 fig., 4 tab., 10 ref.

Descriptors: *Lakes, *Groundwater, *Aquatic weeds, *Growth rates, Dissolved oxygen, Water chemistry, Plant growth, Hardness(Water).
Identifiers: *Hydrilla verticillata.

To learn if proliferation of Hydrilla verticillata was related to maintenance of water levels by additions of groundwater, a study of six adjacent Florida lakes in Hillsborough County compared two lakes that had never received groundwater, two that had recent additions, one that had sporadic additions, and one that had continuous groundwater additions. The hydrilla growth rate was characterized as per-cent dissolved oxygen increase. Based on the growth characteristic and water hardness, the data indicated that those lakes not receiving groundwater had comparatively low hardness values (30 ppm) and about a 19% increase in dissolved oxygen; the lakes that received groundwater had 68 ppm hardness and about a 74% increase in dissolved oxygen. Groundwater additions increased the hardness, magnesium and inorganic carbon levels of the lakes. Results indicated that groundwater additions have been less significant in changing the water chemistry than the fact that groundwater added it all. The ability of hydrilla to use dissolved carbon dioxide and bicarbonate in its photosynthesis and as adjuncts to favorable growth in hard water is an implication to be considered in lake implementation from sources containing calcium carbonates and inorganic carbon. (Auen-Wisconsin)
W77-10139

LIMNOLOGICAL STUDIES IN A LARGE, DEEP, OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA). EVALUATION OF NUTRIENT AVAILABILITY AND CONTROL OF PHYTOPLANKTON PRODUCTION THROUGH IN SITU RADIOBIOASSAY PROCEDURES,
Dartmouth Coll., Hanover, N.H. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-10141

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 5C.
W77-10142

THE EFFECT OF ENVIRONMENTAL FACTORS ON ESTIMATED VIABLE AND TOTAL POPULATIONS OF PLANKTONIC BACTERIA IN LAKES AND EXPERIMENTAL ENCLOSURES,
Freshwater Biological Association, Windermere (England).
For primary bibliographic entry see Field 5C.

W77-10147

UTILIZATION OF ALGAE BY SOME COMMON FISHES OF TWO PONDS,
Christ Church Coll., Kanpur (India). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-10148

MERCURY IN WATERWAYS THAT DRAIN INTO THE WASH, IN EASTERN ENGLAND,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5B.
W77-10152

THE DETERMINATION OF DISSOLVED INORGANIC CARBON, A POSSIBLE SOURCE OF ERROR IN DETERMINING THE PRIMARY PRODUCTION OF LAKE WATER PHYTOPLANKTON,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
For primary bibliographic entry see Field 5C.
W77-10153

A FIELD AND LABORATORY STUDY OF OXYGEN UPTAKE BY PLANKTONIC BLUE-GREEN ALGAE,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
For primary bibliographic entry see Field 5C.
W77-10154

MASS MORTALITIES OF LATES (PISCES: CENTROPOMIDAE) IN LAKE ALBERT,
Ministry of Agriculture and Natural Resources, Monkey Bay (Malawi). Fisheries Research Unit.
D. H. Eccles.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 7-10, 1976. 19 ref.

Descriptors: *Mortality, Earthquakes, *Fishkill, Oxygen, Limnology, *Respiration, Buoyancy, Migration, Hypoxia, Anoxic, Fish migration, Africa.
Identifiers: *Lakes, *Lake Albert(Africa), Centropomidae.

Mass mortalities of fish in Lake Albert are confined to the genus Lates and appear to be size-selective. The attribution of a mass mortality of Late by Parker (1971) to the shock effect of a simultaneous earthquake is questioned. A consideration of the limnology of the lake and of limitations to the ability of fish to adjust their buoyancy suggest that the immediate cause of the mortality could have been loss of hydrostatic equilibrium, caused by a forced rise of the fish due to a surge of oxygen-depleted water from the bottom. Such surges can be initiated by meteorological factors, density currents or earthquakes. (So. African Water Infor. Center)
W77-10191

LARGE SCALE MORTALITY OF FISH AT ST LUCIA,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Zoology.
S. J. Blaber, and A. K. Whitfield.
South African Journal of Science, Vol. 72, No. 7, p 218, July 1976. 2 tab, 4 ref.

Descriptors: *Fishkill, Temperature effects, *Salinity, *Salt tolerance, Lakes, Fish, Mortality, Fungi.
Identifiers: *Lake St Lucia(South Africa), *Osmoregulation.

In May 1976 unexplained mortalities of fish were reported from parts of the St Lucia Lake system and by the beginning of July 1976 aerial reconnaissance showed that a vast mortality had occurred over the entire lake. It was estimated that at least 100 000 fish died. The fish kills coincided with a period of very low salinities in the St Lucia system which were due to unusually high rainfall in the catchment area. It is suggested that the large mortality at St Lucia was due to either a lethal combinations of low salinities and low temperatures leading to osmoregulatory failure, or if the fish survived those conditions, to fungal infection of the skin lesions which usually follow severe osmoregulatory stress. (So African Water Info Center)
W77-10197

THE REPRODUCTION OF BARBUS CF. KIMBERLEYENSIS (PISCES, CYPRINIDAE) IN THE HARDAP DAM, SOUTH WEST AFRICA,
Fort Hare Univ. (South Africa). Dept. of Zoology.
I. G. Gaigher.
Zoologica Africana, Vol. 11, No. 1, p 97-110, 1976. 6 fig, 1 tab, 14 ref.

Descriptors: *Reproduction, Fish growth, Dams, *Spawning, Seasonal, Breeding, Growth rate, Fish, Environmental effects, Killifishes.
Identifiers: Barbus kimberleyensis, South Africa, *Hardap dam(South West Africa).

Only one large yellowfish species occurs in the Hardap Dam, apparently closely related to Barbus kimberleyensis. Though smaller than this species in the Vaal River, it is nevertheless a valuable and abundant angling fish. After maturity, reached in females at 26 cm and in males at 18 cm fork length, females outnumber males by 9:1 beyond 30 cm. Main spawnings occur between February and April, some four months later than in the Vaal River, being correlated with peak seasonal rains in both cases. A minor spawning later in the year is usual, with improved fry survival due to warmer weather conditions reducing the winter mortality of the earlier spawned young. Breeding sites are probably in lentic gravelly-bottomed areas within the dam. Egg production increases from 5-6 000 in 30 cm fish to ca 47 000 in 60 cm females, with strong relationship between cube of fish length and fecundity. (So African Water Info Center)
W77-10218

MALACOLOGICAL STUDIES IN THE LUFIRA (KATANGA) ARTIFICIAL LAKE AREA: DISTRIBUTION AND ECOLOGY OF AQUATIC MOLLUSCS: EPIDEMIOLOGICAL ROLE OF INTESTINAL AND URINARY BILHARZIOSIS VECTORS, (IN DANISH),
For primary bibliographic entry see Field 5C.
W77-10238

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
W. C. Kennard, and M. Wm. Lefor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 776, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 1977. 60 p, 15 fig, 9 tab, 3 ref, 2 append. OWRT A-058-CONN(2), 14-31-0001-4007.

Descriptors: *Wetlands, *Remote sensing, Aerial photography, Data processing, *Evaluation, *Classification, New England, *Connecticut, Vegetation, *Computer programs, Soil types, Soil moisture, Water table, *Land use.
Identifiers: *Freshwater inland wetlands, *Forested wetlands, *Wetlands delineation, Falsecolor infrared aerial photography, Image analysis, *Photointerpretation, Discriminant analysis, Vegetation analysis, Southern New England.

A three-year study on freshwater inland wetlands was conducted covering photointerpretation of low altitude falsecolor infrared (FCIR) aerial photography, field studies, and computer processing of digitized imagery. The study area was a 45 sq mi section of east-central Connecticut, which is representative in type and extent of freshwater inland wetlands in southern New England. With photointerpretation techniques, FCIR imagery can be used to delineate inland wetlands accurately. Photographs taken in the leafless season provided more detail than those taken in the summer. Wetland delineations from FCIR were more accurate than existing wetland maps. Field studies of vegetation showed that certain species and associations are good indicators of wetlands presence. Other parameters investigated were soil pH, depth to water table, soil type, and soil moisture content. It was concluded that a comprehensive definition based upon soils, hydrology, and vegetation was best. Highly accurate classifications of wetlands and open water were obtained with three-dimension digitized FCIR imagery. Also, other types of land use, including paved, urban, and agricultural areas, were detected and classified with a high degree of accuracy. Computer programs were developed for automated land use detection and delineation. (deLara-Conn)
W77-10267

CHARACTERISTICS OF INTERNAL OSCILLATIONS IN LAKE ONTARIO,
New York State Dept. of Environmental Conservation, Albany. Div. of Air Resources.
S. T. Rao, U. Czapski, and L. Sedefian.
Journal of Geophysical Research, Vol. 82, No. 12, p 1725-1734, April 20, 1977. 5 fig, 4 tab, 17 ref.

Descriptors: *Seiches, *Lake Ontario, *Great Lakes, Water levels, Measurement, Sampling, Data processing, Analytical techniques, Lakes, Winds, Currents(Water), Limnology.
Identifiers: *Internal oscillations, *Lake oscillations, Power spectra, Rotary spectra.

The structure of larger-scale motions in Lake Ontario, which are under the influence of the earth's rotation, was analyzed by the application of (1) rotary spectrum analysis, (2) 'constant phase' shape or 'harmonic lock' representation, and (3) bispectrum analysis. A set of continuous wind, current, and temperature data at several depths was extracted from the records of the International Field Year for the Great Lakes network. The results indicated that apart from the well-known primary spectral peak near the inertial period, there exists a significant secondary peak at half this period. A shift of the primary peak beyond the limiting inertial period was observed near the steepest vertical temperature gradient at stations closer to shore. It was suggested that the secondary peak is due to resonant interaction of spectral components near the inertial frequency and that the observed frequency shift below the inertial frequency is due to interaction between the low-frequency waves of the Kelvin type and the Poincare type waves near the inertial frequency. (Sims-ISWS)
W77-10331

FIELD STUDY OF EVAPORATION - ANALYSIS OF DATA FROM EUCUMBENE, CATARACT, MANTON AND MUNDARING,
Bureau of Meteorology, Melbourne (Australia).
For primary bibliographic entry see Field 2D.
W77-10376

CABORA BASSA FISH POPULATIONS BEFORE AND DURING THE FIRST FILLING PHASE,
Grahamstown (South Africa). J.L.B. Smith Inst. of Ichthyology.
P. B. Jackson.
Zoologica Africana, Vol. 11, No. 2, p 373-397, 1976. 13 tab, 3 fig, 22 ref.

Descriptors: *Fish populations, Impoundments, Discharge(Water), Dry seasons, Vegetation, Fish survival, Growth rates, Feeding habits, Reproduc-

tion, Limnology, Fish migration, *Pre-impoundment, *Surveys.
Identifiers: Cabora Bassa, Zambesi River, Lake Kariba, Sarotherodon, Labeo, Hydrocynus, Eichhornia, Salvinia, Southern Africa.

Pre-impoundment surveys were made in 1973-4. The regulatory effect of continual water discharge from Kariba resulted in extensive dry-season aquatic, rooted, vegetal growth and a comparatively high small-fish population. Of a maximum of 38 species found, one, Sarotherodon andersoni, was a new Middle Zambezi record. Lotic and shallow-water species were abundant; gill-nets showed moderately high catches per unit effort. In early November 1974 two-month-old Hydrocynus vittatus juveniles were present indicating an abnormal spawning time. Post-impoundment data from closure on 5 December 1974, to mid-August 1975 are given. The dam filled extremely rapidly to within 10 m of retention level but was thereafter drawn down by heavy floodgate discharge, resulting in continuous slow water-flow and the absence of any stratification or explosive plankton reproduction. Small lotic species, previously abundant, immediately disappeared or became scarce. There was a very high survival of new-spawned young of many migratory species. Growth rates, and abnormal feeding habits caused by post-impoundment stresses, of some of these are described. There was relatively poor reproduction of cichlid species. Soon after closure the first year-class predominated over all other age-groups; these juveniles, and small adult species, concentrated under mats of Eichhornia crassipes. One further species new to the area, Haplochromis carlottae, is recorded. (So. African Water Info. Center)
W77-10380

COMMENTS ON 'FISH COMMUNITIES IN TROPICAL FRESH WATERS' BY R. H. LOWE-MCCONNELL,
Albany Museum, Grahamstown (South Africa).
R. A. Jubb.
Journal of the Limnological Society of South Africa, Vol. 2, No. 1, p 35-36, 1976. 14 ref.

Descriptors: Fish, *Freshwater fish, *Fish migration, *Fish taxonomy, Fish harvest, Larvae, Pumping, Tailraces, Hydroelectric powerplants, Dams.
Identifiers: Zambezi River, Rhodesia, Zambia, Labeo, Barbus, Alestes, Tilapia, Anguilla, Cichlids, Eels, Southern Africa, *Lake Kariba.

Comment is presented on certain statements by R. H. Lowe-McConnell in 'Fish communities in Tropical Freshwaters' (Longman, London, 1975). The validity of statements on the new fish arrivals in Lake Kariba is questioned. The list of newcomers is reduced to six species; the scientific evidence for this statement is discussed. The published accounts of Balon (1972, 1974) and Jackson (1959, 1961) on the fish fauna of Lake Kariba are discussed in some detail. (So African Water Info Center)
W77-10382

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10401

WETLANDS REGULATION: THE TAKING PROBLEM AND PRIVATE PROPERTY INTERESTS,
For primary bibliographic entry see Field 6E.
W77-10461

SHORE STABILITY AND BEACH AND BLUFF PROTECTION METHODS FOR THE ILLINOIS SHORE OF LAKE MICHIGAN.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 2J.
W77-10502

HYDROGEOLOGIC, GEOLOGIC, AND ENGINEERING ASPECTS OF LAKE MICHIGAN SURFICIAL DEPOSITS,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10503

LIVING WITH THE LAKE. A GUIDE TO ILLINOIS LAKESHORE MANAGEMENT.
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 5G.
W77-10504

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: COMPONENT STUDY OF BIOLOGICAL COMMUNITIES.
Illinois Natural History Survey, Urbana.
Illinois Coastal Zone Management Program, Second Year Work Product. Volume IV: Coastal Biological Studies, September 1976. 111 p, 9 tab.

Descriptors: *Ecosystem, *Baseline studies, *Illinois, *Lake Michigan, Ecology, Aquatic populations, Oligotrophy, Great Lakes.
Identifiers: Coastal zone management, Oligotrophic lakes.

Objectives of this study of the Illinois coastal zone ecosystem were: to provide historical perspective to the present state of the shore and nearshore ecosystem; to provide an inventory of plant and animals species of the project; to identify threatened or endangered species of the project area; to identify unusual natural areas within the Illinois coastal zone; to make specific recommendations and to provide general guidelines for the preservation, management, or restoration of the shore and nearshore ecosystem; and to provide a bibliography of biological studies of the shore and nearshore of the Illinois portions of Lake Michigan. During the inventory portion of the study, more than 1,800 species of plants, selected invertebrates, and vertebrates were recorded from the project area. An annotated bibliography of selected biological studies of the shore and nearshore ecosystem, intended to serve as a guide to the literature for the CZM staff and consultants, is included in this report. References are grouped generally by principal subject. (NOAA)
W77-10505

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10506

LAKE ONTARIO ATLAS: LAKE TEMPERATURES,
New York Sea Grant Inst., Albany.
E. Chermack.
Lake Ontario Atlas No. NYSSGP-OA-77-008, 1977. 45 p, 25 fig, 2 tab, 10 ref.

Descriptors: *Air temperature, *Water temperature, *Baseline studies, *Lake Ontario, Temperature, *Maps.

The Lake Temperatures Monograph provides a composite of measurements taken by surface craft, aircraft and intakes. Also included are detailed analysis of surface temperatures by months, vs. air temperatures, bu cumulative frequencies, vs. distance offshore and vs. depth. A slight downward trend in water temperature since the 1930's exists. This monograph will be useful for physical, chemical and biological limnological studies as well as the planning of water and/or sanitary sewer systems. (NOAA)
W77-10508

GREAT LAKES WATER TEMPERATURES, 1966-1975,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
J. L. Grumblatt.
NOAA Technical Memorandum ERL GLERL-11-1 (Paper copy) NOAA Technical Memorandum ERL GLERL-11-2 (Full Microfiche Edition), August 1976. 132 p.

Descriptors: Data collections, Temperature, Temperature distribution, Limnology, Lakes, *Great Lakes, *Water temperature.

A 10-yr bank of water temperature data has been accumulated from a network of stations located at intervals along the United States shores of the Great Lakes and is presented in various tables. For each station, summaries of hourly, daily, and monthly mean data are included as well as tables of the frequency distribution of dail mean water temperatures on an annual basis. (NOAA)
W77-10510

MODEL FOR EVALUATING THE EFFECTS OF DIKES ON THE WATER AND SALT BALANCE OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
K. M. Waddell, and F. K. Fields.
Utah Geological and Mineral Survey Water-Resources Bulletin 21, January 1977. 54 p, 12 fig, 19 tab, 15 ref, append.

Descriptors: *Salt balance, *Model studies, *Great Salt Lake, *Hydrologic budget, Analytical techniques, Inflow, Evaporation, Precipitation(Atmospheric), Saline water barriers, Dikes, Mixing, Saline lakes, Hydraulics.

A model for predicting the water and salt budget for various diking options was developed for Great Salt Lake. The water budget was computed for 1-month intervals during a base period of 1931-73. The storage change during each month of the base period was computed from a budget of surface inflow, ground-water inflow, precipitation on the lake surface, and outflow from evaporation. The total annual inflow (including the inflow deficit as determined during the model calibration) to Great Salt Lake ranged from about 1.5 to 5 million acre-feet. The Bear River contributes the largest percentage of measured surface inflow. The total annual outflow (evaporation) ranged from about 2.2 to 4.0 million acre-feet during 1931-73. The average annual evaporation was 2.98 million acre-feet or 45 inches per year. The options provided in the model for diking include combinations of eight areas east of a line joining Antelope Island, Fremont Island, and the Promontory Mountains. Another option includes that part of Great Salt Lake that lies north of the Southern Pacific Transportation Co. causeway, which divides the main body of the lake into north and south parts. The salt balance of the diked areas is treated from the

standpoint of an inflow-outflow balance with complete mixing, and no allowances are made for any stratification or chemical changes due to interaction with the sediments or solution of entrapped brines or residual salts. (Woodard-USGS)
W77-10563

ACTIVITY OF PHYTOPLANKTON EXCRETED BY FISH,
Tokyo Metropolitan Univ. (Japan). Faculty of Science.
For primary bibliographic entry see Field 5C.
W77-10642

COLONIZATION OF IMPERILED PLANTS IN DREDGED LAKES OF THE UPPER RHINE PLAIN, (IN GERMAN),
Gruenlandwirtschaft Futerbau, Aulendorf (West Germany). Staatliche Versuchsanstalt.
W. Krause.
Beitr Naturkd Forsch Suedwestdtsch 34, p 187-199, 1975.

Descriptors: *Vegetation effects, *Lakes, *Dredging, *Artificial lakes, Vegetation, Shores, Hydrogeology, Environmental effects, Gravels, Plant growth, Grasslands, Groundwater.
Identifiers: Chara braunii, Elatine trianora, West Germany, Myricaria germanica, Nitella tenuissima, Plain, Rhine.

The artificial waters described do not correspond to the normal types of modern dredged lakes. A narrow shore line, which sheltered a single amphibious community with Eleocharitetum acicularis was present on Kondringer Lake (West Germany). In it Elatine trianda and Chara brunii can be found. Wide uneven shoreline, which rises a little over the ground water level, forms a graded habitat, the gravel pit in the deep basin extends to the Kunheimer with Nitella tenuissima and a spring flood extends to the gravel bank with Myricaria germanica. The dredged lakes of the Rhine meadow, Freistetter Upper Lake, and Kunheimer gravel pit belong to a region which formed on a rapidly disappearing and newly rising base. The lake dredgers covered the old, established flora. There is a small irregular habitat in a newly opened nucleus. M. Germanica was found. It belonged to the old original plants of the Rhine meadow which have not been seen between Basel and Strassburg for 40 yr. Freisteller Upper Lake was able to refill the groundwater within less than a year. The freshwater state was maintained for 20 yr without massive plant growth.
W77-10730

A PRODUCTION MODEL FOR MYRIOPHYLLUM SPICATUM L.,
Wisconsin Univ., Madison. Dept. of Botany; and Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W77-10731

EFFECTS OF ACIDITY ON THE PHYTOPLANKTON AND PRIMARY PRODUCTIVITY OF SELECTED NORTHERN ONTARIO LAKES,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10733

HYDROBIOLOGIC DATA ON THE LAKE OF CHAPALA, STATE OF JALISCO (MEXICO), (IN SPANISH),
Instituto Politecnio Nacional, Mexico City. Dept. of Zoology.
E. A. Chavez.
Rev Soc Mex Hist Nat 34, p 125-146, 1973.

Descriptors: *Lakes, *FIsh populations, *Water hyacinth, *Data collections, *Economic impact, Freshwater fish, Transpiration, Aquatic habitats, *Hydrobiology, Fishing, Recreation.
Identifiers: Eichhornia crassipes, Fish species, Jalisco, *Mexico(Lake of Chapala), Biological data.

Chapala lake is the largest in Mexico; fish production was the highest of Mexican freshwater until a few years ago. The biological data available specifically concerned with the water hyacinth problem (Eichhornia crassipes) which has been a problem to fishing, sailing and tourism. Data on transpiration and economical implications of increased area occupied by the water hyacinth and dimished fish catches between 1959-1962 are given. A list of fishes known from the lake is presented.
W77-10736

THE ABUNDANCE OF DIATOMS IN THE SOUTHWESTERN NEARSHORE REGION OF LAKE ONTARIO DURING THE SPRING THERMAL BAR PERIOD,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W77-10741

INFLUENCE OF SEDIMENT INFLOW IN PHYTOPLANKTON PRIMARY PRODUCTIVITY IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10743

ORTHOPHOSPHATE TURNOVER IN EAST AFRICAN LAKES,
Munich Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W77-10752

NITROGEN UPTAKE AND RELEASE IN A FORESTED WATERSHED, LAKE TAHOE BASIN, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10753

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5A.
W77-10758

LAKE MAHEGA: A MESOTHERIC, SULPHATO-CHLORIDE LAKE IN WESTERN UGANDA,
Duke Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10759

INVESTIGATION OF THE HYDROLOGICAL BALANCE IN A PEAT SWAMP,
Brussels Univ. (Belgium).
For primary bibliographic entry see Field 2F.
W77-10768

PRODUCTION OF JUVENILE ALEWIVES, ALOSA PSEUDOHARENGUS, AT LOVE LAKE, WASHINGTON COUNTY, MAINE,
Maine Dept. of Inland Fisheries and Game, Augusta. Fisheries Research Management Div.
K. A. Havey.
Trans Am Fish Soc. Vol 102, No 2, p 434-437, 1973.

Descriptors: Mortality, Maine, *Juvenile fish, Migration.
Identifiers: *Alewives, Alosa-Pseudoharengus, Washington County(Maine), Love lake(Maine).

From 1960-71, 4601 adult anadromous alewives were counted as they entered Love Lake (Maine), to spawn. At the 0.05 probability level the observed numbers of males and females did not differ from a 1:1 ratio. Males averaged 295 + 1.2 mm and females 305 + 1.3 mm in total length. The length difference between sexes was significant at the 95 percent (range 66.6 percent to 100 percent). Between 1960-71, 1,026386 juveniles emigrated from Love Lake. Emigrations varied from 220 in 1962 to 439,062 in 1967. Mathematically weighted mean weight of emigrants for the years 1961, 1963-69, and 1971 was 3.5 g. Weight of emigrants (kg/ha) varied from 0.018-4.794/yr. Number of emigrants/ha/yr varied from 0.81-1614.19. Emigrants/female/yr ranged from 12-3,209. Weight of emigrants/female/yr ranged from 0.09-21.50 kg. There is a significant linear relationship between number of juvenile emigrants and number of adult immigrants 4 yr later. There is also a significant linear relationship between log of magnitude of female escapement and log of numbers of juvenile emigrants produced.--Copyright 1973, Biological Abstracts, Inc.
W77-10779

HYDRAULIC MODELING OF MIXING IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
P. M. Moretti, and D. K. McLaughlin.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY4, Proceedings Paper 12868, p 367-380, April 1977. 14 fig, 1 tab, 11 ref, 2 append. OWRT A-050-OKLA(5).

Descriptors: *Destratification, *Dispersion, *Estuaries, *Hydraulic models, *Lakes, Mixing, Model studies, Laboratory tests, Stratification, Water resources, Oklahoma.
Identifiers: *Hydrodynamics, Mechanical destratification flows, Richardson number, Non-dimensional parameters, Ham's Lake(Okla).

Criteria were developed for laboratory modeling of stratified lake inflows and of mechanical destratification flows. Density measurements and flow visualization were performed in two inflow lake models, which were identical in horizontal dimensions but which differed by a factor of two in vertical dimensions. It was determined that the vertical dispersion process could be accurately modeled if the fundamental modeling parameter was the Richardson number. Similarly, horizontal dispersion could be accurately modeled. Also, a vertically exaggerated model of Ham's lake was constructed, and experiments were run on the mechanical destratification of the model. Surprisingly accurate modeling of the prototype destratification experiments was achieved by using the overall Richardson number as the fundamental non-dimensional parameter. (Roberts-ISWS)
W77-10798

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W77-10799

2I. Water In Plants

A QUANTITATIVE SAMPLER FOR SUBMERGED AQUATIC MACROPHYTES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
For primary bibliographic entry see Field 7B.
W77-10226

THE EFFECT OF FIRE ON THE CALIFORNIA CHAPARRAL VEGETATION,
Academia Sinica, Taipei (Taiwan). Inst. of Botany.
For primary bibliographic entry see Field 5C.
W77-10324

MODIFICATION OF ISLAND VEGETATION AFTER RISING GROUNDWATER LEVELS ON THE DANUBE ISLANDS AT OFFINGEN, (IN GERMAN),
Forstliche Forschungsanstalt, Munich (West Germany). Weldbauinstitut.
P. Seibert.
Beitr Naturkd Forsch Suedwestdtsch 34, p 329-343, 1975.

Descriptors: *Vegetation effects, *Groundwater, *Surface-groundwater relationships, *Islands, *Water table, Vegetation, Rivers, Dams, Ash trees, Forests, Ecology, Shoreline cover, Plant groupings.
Identifiers: Box, Danube, Elm, West Germany, Ground, Haulm, Offingen, Reeds, Sedge, Forest economy, *Site damage.

On the Danube islands near Offingen (West Germany), the ash-elm islands (Querco-Ulmetum minoris) prevail on the sediment of the stream, on the base of the slopes the cover gravel bordering the island was replaced by giant box haulm-ash woods (Carici-remotae-Fraxinetum). Different reed-banks and high sedge reeds were found along stagnant waters. The groundwater level in a part of the island forest region increased to 60-80 cm after the damming of the Danube. The local situation, changed in this way, lead to an extension of the formation of ash-elm islands and to an advancement of reed-bank communities as shown by vegetation photographs and maps. The forest economy suffered permanent site damage with decreased potential yield because of the premature death of the older ash.
W77-10725

COLONIZATION OF IMPERILED PLANTS IN DREDGED LAKES OF THE UPPER RHINE PLAIN, (IN GERMAN),
Gruenlandwirtschaft Futerbau, Aulendorf (West Germany). Staatliche Versuchsanstalt.
For primary bibliographic entry see Field 2H.
W77-10730

EXPERIENCE IN CULTIVATION OF SPHAGNUM MOSSES IN AN ISOLATED MEDIUM, (IN RUSSIAN),
P. L. Bogdanov.
Bot Zh (Leningr) Vol 61, No 8, p 1166-1168, 1976.

Descriptors: *Mosses, Algae, Bacteria, Fungi, Insects, Nematodes.
Identifiers: Capeognata, Infusoria, Sphagnum-Angustifolium.

In a study of the ability of sphagnum mosses to survive, 70 shoots of Sphagnum angustifolium (Russ.) Jens were saturated with water and sealed inside a 1 l jar. On the Surface of the moss were bacteria, hyphae and spores of fungi, single-celled algae and eggs of various insects. The jar was placed in a window in diffused sunlight and observed for 7 yr. The moss began growing from the 1st day and continued to grow throughout the period, with the shoot ends remaining green while the rest turned light brown. On the damp sides of the jar a colony of algae appeared and developed, together with fungal hyphae. A colony of beetles (Capeognata) developed and fed on the hyphae. This and other experiments proved that, with limited water, air and minerals, sphagnum mosses are able to continue living and developing by drastically changing their morphological structure. Fungi, algae, bacteria, infusorians, numatodes and several species of insects are able to coxist in such an isolated non-sterile medium in which a microbiocenosis is established.--Copyright 1977, Biological Abstracts, Inc.
W77-10754

WATER REQUIREMENTS FOR MESQUITE (PROSOPIS JULIFLORA),
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2D.
W77-10770

2J. Erosion and Sedimentation

SPATIALLY AVERAGED FLOW OVER A WAVY SURFACE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2E.
W77-10103

THE MOTION OF A SMALL SPHERE IN A ROTATING VELOCITY FIELD: A POSSIBLE MECHANISM FOR SUSPENDING PARTICLES IN TURBULENCE,
California Univ., San Diego, La Jolla. Inst. of Marine Research; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-10108

INCIPIENT TRANSPORT OF FINE GRAINS AND FLAKES BY FLUIDS-EXTENDED SHIELDS DIAGRAM,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
P. A. Mantz.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 12992, p 601-615, June 1977. 4 fig, 3 tab, 30 ref, 2 append.

Descriptors: *Bed load, *Hydraulics, *Sedimentation, *Shear stress, *Cohesionless soils, Streamflow, Silts, Laboratory tests, Sediments, Data collections.
Identifiers: *Shields diagram, *Incipent transport, Flakes, Flat beds.

Experiments on the incipient transport from flat sediment beds in water streams of four grades of fine cohesionless granular solids and six grades of fine cohesionless flaky solids were reported. The fine granular data were compared with data obtained from recent smaller-scale laboratory experiments, and all data were plotted on a Shields diagram. An 'extended Shields diagram,' which is applicable to cohesionless solids only, was proposed. The fine flaky data were compared with collected data concerned with the incipient transport of coarse two-dimensional solids or flakes. The data again were adapted to the Shields representation. The incipient transport fluid conditions for granular and flaky solids (which solids were chosen as being representative of extreme shape limits) were contrasted. (Singh-ISWS)
W77-10116

PROPORTIONAL WEIRS AS VELOCITY CONTROLLING DEVICES,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-10118

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-10123

SHORELINE FORMS AND SHORELINE DYNAMICS,
Virginia Univ. Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2L.
W77-10130

THE PLAN SHAPE OF CURRENT RIPPLES IN RELATION TO FLOW CONDITIONS,
Reading Univ. (England). Dept. of Geology.
J. R. L. Allen.
Sedimentology, Vol 24, No 1, p 53-62, February 1977. 2 fig, 1 tab, 14 ref.

Descriptors: *Flow characteristics, *Beds, *Streams, *Width, *Depth, Wavelengths, Hydraulics, Environment, Sedimentation, Fluvial sediments, Waves(Water).
Identifiers: *Palaeohydraulics, Plan geometry of ripples.

Two sets of empirical data on the relationship of the plan shape of current ripples to flow conditions previously thought incompatible were reconciled by taking explicit and necessary account of the effects of flow width relative to flow depth. The aspects of plan shape considered were the mean streamwise ripple wavelength and the wavelength, measured across the flow, of longitudinal features due to centrifugal instability formed on the backs of the ripples. A regression analysis connecting these attributes with flow conditions including the width-effect showed that the amount of unexplained variability is of the same order as the accumulated experimental errors, and suggested that the two sets of data are in excellent agreement. The relationship of the plan geometry to flow conditions is less simple than has sometimes been supposed, but ways were suggested in which the experimental results can be used to establish the hydraulics of past environments. (Bhowmik-ISWS)
W77-10132

HEAVY METALS IN CHESAPEAKE BAY SEDIMENTS,
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-10174

SIMULATION OF THE SEDIMENTOLOGY OF SEDIMENT DETENTION BASINS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5G.
W77-10185

SEDIMENTS, STRUCTURAL FRAMEWORK, AND EVOLUTION OF DELAWARE BAY, A TRANSGRESSIVE ESTUARINE DELTA,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W77-10186

A COASTAL ENGINEERING STUDY OF INDIAN RIVER INLET, DELAWARE,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 8B.
W77-10189

TRIPOLYPHOSPHATE AND PYROPHOSPHATE HYDROLYSIS IN SEDIMENTS,
Monsanto Philippines Inc., Makati.
For primary bibliographic entry see Field 5B.
W77-10285

SPEED OF INERTIAL BED LOAD DISTURBANCES,
Central Water and Power Research Station, Poona (India).
For primary bibliographic entry see Field 8B.
W77-10305

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
For primary bibliographic entry see Field 8B.
W77-10315

ESTIMATES OF CENOZOIC OCEANIC SEDIMENTATION RATES,
Middlebury Coll., Vt. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W77-10320

TRANSPORT PHASES OF TRANSITION METALS IN THE AMAZON AND YUKON RIVERS,
Delaware Univ., Lewes. Marine Studies Complex.
R. J. Gibbs.
Geological Society of America Bulletin, Vol. 88, No. 6, p 829-843, June 1977. 15 fig, 8 tab, 35 ref.

Descriptors: *Sediment transport, *Rivers, *Metals, Sediments, Suspended solids, Trace elements, Chromium, Manganese, Iron, Cobalt, Nickel, Copper, Sampling, On-site data collections, Data processing.
Identifiers: *Amazon River, *Yukon River, Transition metals.

Samples representing yearly averages of material transported by the Amazon and Yukon Rivers were analyzed to separate the transition metals (Cr, Mn, Fe, Co, Ni, and Cu) into the following transport phases: (1) crystalline particles, (2) metal hydroxide coatings, (3) solid organic material, (4) sorbed material, and (5) those in solution. The major transport phases are crystalline particles and metal hydroxide coatings, which when combined carry 65 to 92% of the transition metals transported. Solid organic material, the next most important phase, transports between 5 and 19% of the total transported. Material carried in solution transports 0.6 to 17% of the total transported. Sorbed transition metals account for between 0.02 to 8% of the total transported. Metal hydroxide coatings represent the major transporting mechanism potentially available to organisms, since, for the Amazon and Yukon Rivers respectively, 87 and 78% of the Fe, 69 and 73% of the Mn, and 71 and 69% of the Ni are transported in this form. Comparing the concentrations of transition metals carried to the oceans with the concentrations on the continents, a high Cu ratio (5 to 7) indicates continental depletion or river output enrichment; a moderate ratio (1.1 to 1.7) for Ni, Co, and Cr indicates intermediate depletion or enrichment, and a near-unity ratio for Fe and Mn indicates little depletion or enrichment. The sediments transport more than 97% of the total mass of transition metals to the world's oceans. (Sims-ISWS)
W77-10328

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10401

CONSEQUENCES DU DEPLACEMENT DES SEDIMENTS SUR LA DISPERSION DES RADIONUCLEIDES, (THE EFFECT OF SEDIMENT DISPLACEMENT ON THE DISPERSAL OF RADIONUCLIDES),
Electricite de France, Chatou.
For primary bibliographic entry see Field 5B.
W77-10402

SHORE STABILITY AND BEACH AND BLUFF PROTECTION METHODS FOR THE ILLINOIS SHORE OF LAKE MICHIGAN.
Army Engineer District, Chicago, Ill.
Illinois Coastal Zone Management Program, Second Year Work Product. Volume III: Beach and Bluff Protection Technical Appendix, July 1976. 245 p, 9 fig, 16 tab, 41 ref, 106 plates.

Descriptors: *Shore protection, *Environmental effects, *Erosion, *Illinois, *Lake Michigan, Social impact, Cost analysis.
Identifiers: Bluff instability, Engineering design, Coastal Zone Management.

The purpose of the study was to investigate shore erosion and bluff instability problems along the Illinois shore of Lake Michigan, and to develop preliminary engineering designs and cost estimates for suitable methods of shore protection. The report discusses the following items: (1) the general factors influencing shore erosion and bluff instability; (2) specific shore processes occurring along the Illinois shore; (3) the general types of engineering and management techniques available for reducing shoreland erosion damages; (4) preliminary engineering designs for suitable methods of shore protection along the endangered shoreland reaches within the study area; (5) the impacts of these measures on the adjacent shores; (6) preliminary cost estimates for the shore protection methods considered; and (7) the general environmental and social impacts of these methods. (NOAA)
W77-10502

HYDROGEOLOGIC, GEOLOGIC, AND ENGINEERING ASPECTS OF LAKE MICHIGAN SURFICIAL DEPOSITS,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
P. B. DuMontelle, K. L. Stoffel, and J. J. Brossman.
Illinois Coastal Zone Management Program, Second Year Work Product. Volume II: Coastal Geological Studies, (1976). 98 p, 17 fig, 2 tab, 19 ref, 2 append.

Descriptors: *Lake Michigan, *Erosion, *Shore protection, *Illinois, Drainage, Groundwater, Rainfall.
Identifiers: Coastal Zone Management.

The basic characteristics that determine erosion susceptibility, foundation stability, weathering qualities, slump resistance, and drainage performance of the Illinois Lake Michigan shore bluffs were studied in detail. Groundwater data (hydrological data) were gathered from weather records, from piezometer installations at Lake Bluff, and from bluff-line seep studies along the entire shore. These indicate the presence of drainage problems most of which are related to above-average rainfall conditions. Geologic data derived from bluff exposures and fourteen research boreholes describe the stratigraphic sequence in detail. Foundation strengths, unconfined compressive strengths, moisture content, liquid limits, plasticity indices, shear strengths and wet and dry densities were measured. Slope failure is related to groundwater pore pressure which correlates directly to maximum annual groundwater levels but not directly to regional precipitation - annual fluctuation in pore pressure being partly dependent on the effects of vegetation. (NOAA)
W77-10503

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
P. L. Drake, C. K. Anchor, R. C. Berg, and C. Collinson.
Illinois Coastal Zone Management Program, Second Year Work Product, Volume II Appendix: Map Atlas Lake Michigan Shore in Illinois, (1976). 56 p, entirely maps.

Descriptors: *Maps, *Shore protection, *Engineering structures, Coasts, Beach erosion, *Lake Michigan, *Illinois.
Identifiers: Coastal zone management.

Basic reference maps were compiled through the use of data, maps and photos from other projects at the planning scale of 1 in. = 200 ft (1/2400). The maps, based on aerial orthophotographs taken in April 1975, were compared with low level oblique aerial photographs and brought up-to-date for the summer of 1976. The maps show all groins, riprap and rubble, bulkheads, retaining walls, sheet piling, piers and jetties as well as unidentifiable submerged structures. Most street names and all streets are shown, as are property boundaries, municipal boundaries, section corners and reservations such as the Great Lakes facility and Fort Sheridan. Parks and beaches, as well as sanitary and water supply facilities are shown along with major buildings on the shore. The April 1975 shore and blufflines are shown along with the anticipated 100-year recession line (2075 AD). (NOAA)
W77-10506

MISSOURI RIVER TEMPERATURE EFFECTS IN THE TRANSITION FROM DUNES TO PLANE BED,
Colorado State Univ., Fort Collins; and Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-10572

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
For primary bibliographic entry see Field 4A.
W77-10612

PREDICTION OF VELOCITY DISTRIBUTION IN A VORTEX TUBE SEDIMENT TRAP WITH TURBULENCE MODELS,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4D.
W77-10657

GENETIC ANALYSIS OF THE SUSPENDED LOAD DISCHARGE OF MOUNTAIN RIVERS,
Tashkent Univ. (USSR).
O. P. Shcheglova.
Soviet Hydrology, Selected Papers, Issue No 4, p 271-277, 1975. 6 fig, 1 tab, 9 ref. Translated from News of the USSR Academy of Sciences, Geographic Series (Izvestiya Akad. nauk SSSR. Ser. geograf.), No 5, p 100-109, 1975.

Descriptors: *Suspended load, *Sediment discharge, *Rivers, *Asia, Mountains, Foreign countries, Erosion, Scour, Channel erosion, Rain water, Snowmelt, Glaciers, Currents(Water), Sediment yield, Data collections.
Identifiers: *USSR.

The formation of the suspended load discharge of mountain rivers, particularly those of Soviet Central Asia, has not been given much attention by researchers. Analysis of extensive data on the rivers of Soviet Central Asia showed that difficulties are frequently involved in classifying the nature of the increase in suspended particle concentration on its chronological graph. The thermal analysis method was used in analyzing the origin of the increase in suspended particle concentration on its chronological graph. The thermal analysis method was used in analyzing the origin of the increase in suspended particle concentration. The method was based on the construction and subsequent interpretation of the relation of suspended particle concentration (or water discharge) to air temperature. Thermal analysis made it possible to determine the origin of the suspended particle concentration of meltwater or rain floods. A table gave the percentage of various supply sources of the suspended load discharge for the mountain rivers of Soviet Central Asia. Correlation among the three components of basin erosion, i.e., rain water, snowmelt water, and glacial water, varied within broad limits. (Humphreys-ISWS)
W77-10778

WATERSHED SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 4D.
W77-10790

STOCHASTIC ASPECTS OF INCIPIENT GRAIN MOTION ON RIVERBEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. Gessler.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 25, Colorado State University, Fort Collins, p 25-1 - 25-26, 1976. 12 fig, 1 tab, 20 ref, 1 append.

Descriptors: *Model studies, *Sediment transport, *River beds, *Stochastic processes, Traction, Movement, Sediments, Sediment sorting, Turbulent flow, Mathematical models, Evaluation, Boundary processes, Sediment-water interfaces.
Identifiers: Incipient motion, Armor coat.

The development of an armor coat in a flume experiment is clearly a very dynamic, unsteady process. Any attempt to explain such a development, which is most closely related to the incipient motion problem, by means of a steady model must have severe shortcomings. A new model presented took into account the development in time of the armor coat, but it was lacking in many respects. For one, experimental data necessary for a true testing of the model is not available. The purpose of presenting the new model is twofold: (1) to show that there are still other stochastic models, not necessarily more complicated than existing models; and (2) should the analytical result explain some yet unexplained characteristics, the model may point out a direction for future research. It was assumed in developing the model: (1) that grains are removed due to the turbulent fluctuations in velocity rather than the steady-state average shear stress; (2) that a grain is removed if the shear stress exceeds some critical value; (3) that the length scale of the flow field involved is the size of the largest grains on the bed, which is quite well established through the observation of the controlling roughness height with respect to the friction factor; (4) that the time scale is established through the ratio of maximum grain size and shear velocity. (See also W77-10439) (Humphreys-ISWS)
W77-10792

SEDIMENT TRANSPORT MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
H. W. Shen.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 26, Colorado State University, Fort Collins, p 26-1 - 26-33, 1976. 9 fig, 1 tab, 47 ref.

Descriptors: *Model studies, *Sediment transport, *Stochastic processes, *Alluvial channels, Mathematical studies, Mathematical models, Theoretical analysis, Sediment load, Suspended load, Bed load, Equations, Flow, Rivers, Streambeds, River beds, Movement, Saltation, Sand waves, Statistical methods, Shape.
Identifiers: Flat bed, Bed profile.

This chapter discussed the sediment transport capability of a given flow for cohesionless sediments only. Some advantages of a probabilistic approach to sediment transport rate are: (1) Sediment motion and bed form development are random processes, and thus the stochastic process is the most natural approach. The stochastic approach follows the actual movements of particles. (2) The stochastic approach is perhaps the only potentially fruitful approach to sediment with a large range of size distributions. (3) Theoretically, the stochastic approach allows much more freedom in fitting experimental curves than does a pure dimensional analysis. (4) Normally the stochastic approach is best suited to an extremely complex process, and sediment transport is certainly very complex. (5) The dispersion of the bed load particles (or a certain portion of them) must be studied from a stochastic approach. (See also W77-10439) (Humphreys-ISWS)
W77-10793

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W77-10794

DISPERSION OF SEDIMENT PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 28, Colorado State University, Fort Collins, p 28-1 - 28-26, 1976. 13 fig, 1 tab, 27 ref.

Descriptors: *Dispersion, *Sediments, *Stochastic processes, *Open channel flow, *Model studies, Sedimentation rates, Movement, Suspended solids, Beds, Flow, Theoretical analysis, Analytical techniques, Laboratory tests, Alluvial channels, Path of pollutants, Bed load, Mathematical models, Graphical analysis.

This chapter described and developed mathematical models for the settling of suspended sediment particles and the dispersion of sediment bed particles which move as bed load. Solid particle settlement in turbulent flow is a random phenomenon, and therefore, the analysis for mean settling length was based on a random walk model with the use of currently available Eulerian flow information. The analysis for dispersion of contaminated sediment bed particles was based on a stochastic model, and the shape factor in the Gamma distribution was allowed to take on integral values from one to three. For a given degree of pollution, the critical duration increases downstream, and the increase is in direct proportion to the square root of the distance from the source where the normality approximation is satisfactory. With radioactive contaminants, the absorption rate is given by the inverse square law. Owing to mathematical complexity, the critical durations for given adsorption levels were presented graphically. (See also W77-10439) (Humphreys-ISWS)
W77-10795

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W77-10799

2K. Chemical Processes

VARIATION IN CHEMICAL COMPOSITION OF THE RIVER FROME, ENGLAND, FROM 1965 TO 1972,
Freshwater Biological Association, East Stoke (England).
For primary bibliographic entry see Field 5C.
W77-10138

EFFECT OF SURFACTANTS ON THE DETERMINATION OF ALUMINUM IN WATERS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5A.
W77-10151

THE DESIGN OF A FULLY AUTOMATIC LIQUID INJECTION APPARATUS FOR USE ON A CARBON ANALYSER,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10209

THE RELEASE OF NITROGEN FROM SULFUR-COATED UREA AS AFFECTED BY SOIL MOISTURE, COATING WEIGHT, AND METHOD OF PLACEMENT,
Woods (M. J.) and Associates, Dublin (Ireland).
For primary bibliographic entry see Field 2G.
W77-10270

AN EVALUATION OF JOB'S METHOD OF CONTINUOUS VARIATIONS AS APPLIED TO SOIL ORGANIC MATTER-METAL ION INTERACTIONS,
Georgia Univ., Athens. Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W77-10273

INFLUENCE OF SOIL PH ON THE AVAILABILITY OF ADDED BORON,
Wisconsin Univ., Madison. Dept. of Soil Science; and Wisconsin Univ., Madison. Dept. of Horticulture.
For primary bibliographic entry see Field 2G.
W77-10274

EXCHANGE AND HYDRATION PROPERTIES OF CU(2+) ON MIXED-ION NA(+) - CU(2+) SMECTITES,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10276

POTASSIUM RELEASE FROM SAND, SILT, AND CLAY SOIL SEPARATES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-10277

THEORETICAL CONSIDERATION ON NITRITE SELF-DECOMPOSITION REACTIONS IN SOILS,
Ghent Rijksuniversiteit (Belgium). Lab. of Physical and Radiobiological Chemistry.
For primary bibliographic entry see Field 2G.
W77-10279

CORRELATION OF PLANT MANGANESE WITH EXTRACTABLE SOIL MANGANESE AND SOIL FACTORS,
Minnesota Univ., Waseca. Southern Experiment Station.
For primary bibliographic entry see Field 2G.
W77-10281

INFLUENCE OF SALT AND ALKALI ON IONIC EQUILIBRIA IN SUBMERGED SOILS,
International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 2G.
W77-10282

ZINC ADSORPTION ISOTHERMS FOR SOIL CLAYS WITH AND WITHOUT IRON OXIDES REMOVED,
Georgia Univ., Athens. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10284

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10556

REACTIONS OF METAL IONS AT SURFACES OF HYDROUS IRON OXIDE,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. D. Hem.
Geochimica et Cosmochimica Acta, Vol 41, p 527-538, 1977. 12 fig, 41 ref, append.

Descriptors: *Geochemistry, *Heavy metals, *Chemical reactions, *Iron oxides, *Aqueous solutions, Oxidation-reduction potential, Solubility, Sorption, Iron, Manganese, Copper, Chromium, Molybdenum, Silver, Vanadium, Arsenic.

Redox processes involving ferrous iron and hydrous ferric oxide may be coupled to chemical reactions of other elements to decrease their solubility in aqueous systems. Processes considered are: (1) Reduction of Ag, Cu, and Cr coupled to oxidation of Fe, (2) Catalysis of oxidation of Mn, (3) Precipitation of ferrous vanadate or molybdate, and (4) Coprecipitation by incorporation of metal ions in altered ferric hydroxide crystal structure. Concentrations below one microgram per liter are attainable for almost all the elements considered through these processes. (Woodard-USGS)
W77-10566

GEOCHEMISTRY OF GEOPRESSURED GEOTHERMAL WATERS FROM THE FRIO CLAY IN THE GULF COAST REGION OF TEXAS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
Y. K. Kharaka, E. Callender, and R. H. Wallace, Jr.
Geology, Vol 5, p 241-244, April 1977. 1 tab, 25 ref.

Descriptors: *Geochemistry, *Thermal water, *Chemical analysis, *Oil fields, Salinity, Dissolved solids, Geothermal studies, *Formation water, *Gulf coast(Tex).

Detailed chemical analyses of 54 formation-water samples from the Frio Clay from 11 oil and gas fields in the Houston-Galveston and Corpus Christi areas, Texas, indicate that the salinity of water in the geopressured zone ranges from about 20,000 to 70,000 mg/liter dissolved solids. Samples from many gas wells yield low salinities that are not representative of the true salinity of formation water because of dilution by condensed water vapor produced with natural gas. Quartz and Na-K-Ca geothermometers are used in conjunction with the measured subsurface temperatures to identify the diluted samples and to estimate their true salinities. Better understanding of the geochemistry of geopressured geothermal waters is needed to minimize the problems associated with their use as a source of energy. (Woodard-USGS)
W77-10568

CHEMISTRY AND VEGETATION OF HIGHLY ACIDIC STREAMS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W77-10744

2L. Estuaries

THE SACRAMENTO-SAN JOAQUIN DELTA AND THE EVOLUTION AND IMPLEMENTATION OF WATER POLICY: AN HISTORICAL PERSPECTIVE,
California Univ., Davis. Dept. of History.
For primary bibliographic entry see Field 6E.
W77-10101

BUOYANT SURFACE DISCHARGE AND SMALL-SCALE OCEANIC FRONTS: A NUMERICAL STUDY,
Catholic Univ. of America, Washington, D.C. Dept. of Civil Engineering.
T. W. Kao, C. Park, and H-P. Pao.
Journal of Geophysical Research, Vol. 82, No. 12, p 1747-1752, April 20, 1977. 8 fig, 8 ref. NSF ENG75-09347, ONR N00014-77-C-0017.

Descriptors: *Water circulation, *Coasts, *Estuaries, Model studies, Mathematical models, Flow, Rivers, Brackish water, Density, Salinity, Inflow, Currents(Water), Turbulent flow, Turbulence, Oceans, Oceanography.
Identifiers: Fronts(Oceanic).

A study was made of the two-dimensional buoyant surface discharge into an ambient body of water. The numerical study was based on an initial boundary value problem using the full Navier-Stokes and diffusion equations. A turbulence model using the Munk-Anderson parameterization formula for density stratification effect also was incorporated. The results showed the establishment of a surface density current with strong surface convergence and downwelling near the front. Comparison was made with the field experiments of Garvine and Monk on a small-scale oceanic front in Long Island Sound. Excellent agreement was obtained. (Sims-ISWS)
W77-10104

EVIDENCE FOR BAROCLINIC INSTABILITY OF THE NORWEGIAN CURRENT,
British Columbia Univ., Vancouver. Dept. of Mathematics; and British Columbia Univ., Vancouver. Inst. of Oceanography.
L. A. Mysak, and F. Schott.
Journal of Geophysical Research, Vol. 82, No. 15, p 2087-2096, May 20, 1977. 9 fig, 2 tab, 15 ref.

Descriptors: *Ocean currents, *Variability, *Model studies, Mathematical models, On-site investigations, Current meters, Oceans, Circulation, Ocean circulation, Temperature, Water temperature, Salinity, Density, Oceanography.
Identifiers: *Norwegian Current.

Hydrographic and current observations of the Norwegian Current showed a considerable amount of low-frequency variability; in particular, many of the current spectra are broadly peaked at around 2-3 days. In this paper, a number of simple barotropic and baroclinic instability models of the mean flow in an attempt to explain these fluctuations are considered. The theoretical results suggest that the current fluctuations most likely are due to baroclinic instability of the mean flow. (Sims-ISWS)
W77-10107

THE MOTION OF A SMALL SPHERE IN A ROTATING VELOCITY FIELD: A POSSIBLE MECHANISM FOR SUSPENDING PARTICLES IN TURBULENCE,
California Univ., San Diego, La Jolla. Inst. of Marine Research; and Scripps Institution of Oceanography, La Jolla, Calif.
P. F. Tooby, G. L. Wick, and J. D. Isaacs.
Journal of Geophysical Research, Vol. 82, No. 15, p 2096-2100, May 20, 1977. 4 fig, 12 ref.

Descriptors: *Suspended solids, *Turbulence, *Laboratory tests, Eddies, Turbulent flow, Reynolds number, Drag, Viscosity, Movement, Water circulation, Erosion, Sediments, Velocity, Surf, Coasts, Beaches, Oceanography.

The diffusion and transport of particles suspended in turbulent flows depend on the interaction between the particles and the turbulence. To investigate a possible particle-turbulence interaction, particle trajectories were observed in a rotating fluid with a solid body velocity profile, as might occur in the core of a vortex or an eddy. The experiments were conducted with a series of single small spheres (with low particle Reynolds numbers) sinking or rising in a horizontal cylinder rotating about its central axis at a constant speed. Each sphere was found to follow a nearly circular orbit in a vertical plane perpendicular to the cylinder axis. The orbit center lay very near the horizontal plane through the axis of the cylinder and was at the point in the fluid where the velocity of the fluid as equal and opposite to the terminal velocity of the particle. The particle trajectories also evolved slowly, spiraling either inward or outward. A theoretical description of the particle motion shows that the two principal forces on the particle, fluid drag and gravity-buoyancy, account for the circular motion. A force due to particle inertia (a centrifugal force from the center of its orbit), a small position-dependent wall effect on drag, a very small force (also affected by the walls), and a very small centrifugal buoyancy force account for the long-term inward or outward spirals. This kind of systematic interaction in which particles seek and remain in fluid closely opposing their own motion could have a role in the suspension of small particles in some turbulent flows. (Sims-ISWS)
W77-10108

OXYGEN-SAG IN A TIDAL RIVER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-10114

THE SEA SURFACE TEMPERATURE DEVIATION AT VERY LOW SPEEDS; IS THERE A LIMIT,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
K. B. Katsaros.
Tellus, Vol 29, No 3, p 229-239, June 1977. 1 fig, 3 tab, 44 ref. ONR N00014-67-A-0103-0014, NSF GA-40324.

Descriptors: *Water temperature, *Heat balance, *Boundary layers, *Winds, Evaporation, Radiation, Temperature, Heat transfer, Water bodies, Oceans, Convection, Turbulence, Surface tension, On-site investigations, Laboratory tests, Oceanography.

Laboratory and field measurements of the temperature drop across the boundary layer at the upper surface of evaporating and cooling water in turbulent free convection showed that greater values are possible than previously indicated. An

upper limit on the surface temperature deviation is imposed only by the maximum heat loss occurring in the earth's most extreme climates. (Sims-ISWS)
W77-10120

PLUTONIUM AND AMERICIUM ACTIVITIES IN THE NORTH SEA AND GERMAN COASTAL REGIONS,
Deutches Hydrographisches Institut, Hamburg (West Germany).
For primary bibliographic entry see Field 5B.
W77-10122

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W77-10123

RELATIONSHIP BETWEEN NITROGEN FIXATION (ACETYLENE REDUCTION) AND THE C:N RATIO IN A POLLUTED CORAL REEF. ECOSYSTEM, KANEOHE BAY, HAWAII,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10124

SOMALI CURRENT: RECENT MEASUREMENTS DURING THE SOUTHWEST MONSOON,
Woods Hole Oceanographic Institution, Mass.
J. G. Bruce.
Science, Vol 197, No 4298, p 51-53, July 1, 1977. 2 fig, 5 ref. ONR N00014-74-C-0262, NSF ATM74-22226A01.

Descriptors: *Currents(Water), *Ocean currents, *Water temperature, *Indian Ocean, Monsoons, On-site data collections, Winds, Sampling, Surveys, Bathymetry, Ocean circulation, Oceanography.
Identifiers: *Somali Current.

The Somali current was measured at approximately maximum strength for the year during the southwest monsoon on 11 and 12 August 1975 (approximately 1 1/2 days) at stations spaced 20 to 35 km apart. The measurements permit a nearly synoptic detailed mapping of the temperature structure of a major western boundary current. (Sims-ISWS)
W77-10128

SHORELINE FORMS AND SHORELINE DYNAMICS,
Virginia Univ. Charlottesville. Dept. of Environmental Sciences.
R. Dolan, B. Hayden, J. Heywood, and L. Vincent.
Science, Vol 197, No 4298, p 49-51, July 1, 1977. 4 fig, 13 ref. NASA NAS5-20999.

Descriptors: *Shores, *Atlantic Ocean, *Beaches, Erosion, Beach erosion, Geomorphology, Coasts, Islands, Barrier islands, Storm surge, Dynamics.
Identifiers: *Shoreline forms, *Shoreline dynamics, *Assateaque Island(Md-Va), *Capes.

Atlantic coast barrier-island shorelines are sinuous in plain view, with curvatures ranging in size from cusps to capes. The orientation of shoreline segments within the larger of these sinuous features (10 to 15 km between apexes) is significantly related to shoreline dynamics. (Sims-ISWS)
W77-10130

PRIMARY PRODUCTION STUDIES IN PORTO NOVO WATERS, S. INDIA,
Centre of Advanced Study in Marine Biology, Porto Novo (India).
For primary bibliographic entry see Field 5C.
W77-10140

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF WATERS IN AN INDUSTRIALIZED ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 5C.
W77-10145

THE INFLUENCE OF SALINITY ON THE GROWTH OF SOME PLANKTON DIATOMS FROM BRACKISH WATER,
Oslo Univ. (Norway). Section of Marine Botany.
For primary bibliographic entry see Field 5C.
W77-10146

SEASONAL CHANGES IN TWO ALGAL POPULATIONS FROM THE COASTAL WATERS OF WASHINGTON STATE,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10150

HEAVY METALS IN CHESAPEAKE BAY SEDIMENTS,
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-10174

SEDIMENTS, STRUCTURAL FRAMEWORK, AND EVOLUTION OF DELAWARE BAY, A TRANSGRESSIVE ESTUARINE DELTA,
Delaware Univ., Newark. Coll. of Marine Studies.
C. B. Weil.
Sea Grant Technical Report No. DEL-SG-4-77, (1977). 199 p, 70 fig, 6 tab, 128 ref, 2 append. SG-2-35-233; NSF-GH-109, NSF-GB-27725.

Descriptors: *Estuarine environment, *Deltas, *Sedimentation, *Geomorphology, Bays, Erosion, Circulation, Salt marshes, Sediment distribution, Sea level, Tidal effects, Geologic history, Mudflats, Bottom sediments.
Identifiers: *Delaware Bay, Tidal currents.

Grain-size analyses of 411 bottom surface sediments from Delaware Bay show a distinctive pattern of progressive sorting, with grain size decreasing in the upbay direction and toward shore. The texture pattern is produced by tidal currents and is related to bathymetry. The relationships of transgressive Holocene estuarine deltaic environments in the subsurface are complex because different parts of the sedimentary record may be present or absent depending upon the extent of erosion at the shoreline, deposition and sediment reworking on the subtidal flats, and deposition of linear sand shoals associated with tidal channel development. The major sedimentary environments of the tide-dominated transgressive Delaware delta include: (1) the subaerial tidal marshes and washover barrier beaches in the lower bay; (2) the fine-grained deposits of the subtidal flats; (3) the linear sand shoals; and (4) the estuary mouth shoal complex with mutually evasive tidal channels and flood tidal delta. The Delaware Estuary, characterized by a low supply of coarse sediment, rising relative sea level, and intensive sediment reworking by tidal currents, is a depositional model for the transgressive estuarine delta. (NOAA)
W77-10186

DELAWARE BAY ICE CONDITIONS, 1977,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, R. R. Rumer, G. R. Davis, and R. Crissman.
Sea Grant Technical Report No. DEL-SG-9-77, (1977). 34 p, 32 fig, 8 ref.

Descriptors: *Delaware River, *Ice cover, *Damages, Weather data, Shellfish, Clams, Crabs, Oysters.
Identifiers: *Delaware Bay, Cold weather.

As a result of the extreme cold weather during the 1976-1977 winter, an unusually large amount of ice formed in the Delaware Bay and River. By the first of February an estimated $115,000 in damage and lost time had been suffered by Delaware's crab, clam, and oyster fishermen. To map the extent and type of ice cover, four flights were made over the area from the Delaware Memorial Bridge to the mouth of Delaware Bay. Visual observations were recorded on maps of the area and color and black and white photographs were taken to back up the observations. (NOAA)
W77-10188

A COASTAL ENGINEERING STUDY OF INDIAN RIVER INLET, DELAWARE,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 8B.
W77-10189

SYNERGISTIC EFFECTS OF MARINE POLLUTION,
Leeds Univ. (England). Wellcome Marine Lab.
For primary bibliographic entry see Field 5C.
W77-10202

CADMIUM CONCENTRATIONS IN THE TISSUES OF BULLIA DIGITALIS (PROSOBRANCHIATA) FROM THE SOUTH AFRICAN WEST COAST,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10203

METALS IN ORGANISMS FROM SALDANHA BAY AND LANGEBAAN LAGOON PRIOR TO INDUSTRIALIZATION,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
For primary bibliographic entry see Field 5C.
W77-10205

THE ZOOPLANKTON OF MSIKABA ESTUARY,
Port Elizabeth Museum (South Africa).
T. Wooldridge.
Zoologica Africana, Vol. 11, No. 1, p 23-44, 1976. 6 fig, 4 tab, 12 ref.

Descriptors: *Zooplankton, *Estuaries, *Stratification, Vertical distribution, Seasonal, Biomass, Rainfall, Geomorphology, Salinity, Temperature distribution, Plankton, Ecology, Sampling, Distribution patterns.
Identifiers: South Africa, *Msikaba estuary(Transkei).

Msikaba Estuary is situated in the northern subtropical area of the Transkei coastal region, South Africa, at latitude 31 degrees 19'S. It is possibly the deepest South African estuary with a maximum recorded depth of 35 m. A recurved sandbar is well-established at the mouth and the estuary is connected to the sea by a relatively narrow and shallow channel. Stratification is well developed in Msikaba estuary and has a major influence on the distribution of the zooplankton. The oligohaline zooplankton component does not become well established, while marine zooplankton organisms penetrate relatively far up the estuary in the high salinity bottom waters. The euryhaline component becomes relatively well established near the mouth and it would appear that these organisms maintain their position within the estuary by vertical migration between inflowing bottom and outflowing surface waters. Seasonal means of zooplankton biomass were similar and ranged between 16 mg/m3 of water during winter and 15

mg/m during summer. (So African Water Info Center)
W77-10214

INDICATORS OF HEAVY-METAL CONTAMINATION IN THE LOOE ESTUARY (CORNWALL) WITH PARTICULAR REGARD TO SILVER AND LEAD,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5A.
W77-10228

THE MACROBENTHIC FAUNA OF ROCKS AND BOULDERS IN THE LUBECK BAY (WESTERN BALTIC SEA) INVESTIGATED FROM THE UNDERWATER LABORATORY 'HELGOLAND',
Trondheim Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5C.
W77-10232

SURVIVAL OF MARINE PHYTOPLANKTON IN HIGH CONCENTRATIONS OF HEAVY METALS, AND UPTAKE OF COPPER,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 5C.
W77-10233

THE EFFECT OF A NO. 2 FUEL OIL AND SOUTH LOUISIANA CRUDE OIL ON THE BEHAVIOR OF THE SOFT SHELL CLAM, MYA ARENARIA L.,
Rutgers - The State Univ., Newar, N. J. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W77-10234

EFFECTS OF LIGHT AND AMMONIUM ON NITRATE UPTAKE BY TWO SPECIES OF ESTUARINE PHYTOPLANKTON,
City Coll., New York. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-10241

A DESCRIPTIVE EVALUATION OF THE EFFECTS OF NO. 2 FUEL OIL ON THE TISSUES OF THE SOFT SHELL CLAM, MYA ARENARIA L.,
Industrial Environmental Research Lab.-Cincinnati, Edison, N.J. Oil and Hazardous Materials Spills Branch.
For primary bibliographic entry see Field 5C.
W77-10243

THE ECOLOGY OF EELGRASS, ZOSTERA MARINA (L.), FISH COMMUNITIES. I. STRUCTURAL ANALYSIS,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W77-10244

THE EFFECTS OF TEMPERATURE AND SALINITY ON THE EMBRYONIC DEVELOPMENT OF HYDROBIA ULVAE (PENNANT),
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10245

EFFECTS OF FISH FACTORY EFFLUENT ON THE BENTHIC MACROFAUNA OF SALDANHA BAY,
Cape Town Univ. (South Africa). Dept. of Zoology; and Department of Planning and the Environment, Capetown (South Africa).
For primary bibliographic entry see Field 5C.
W77-10246

UPTAKE FROM SEA WATER AND CLEARANCE OF 14C-P,P'-DDT BY THE MARINE COPEPOD CALANUS FINMARCHICUS,
Bedford Inst. of Oceanography, Dartmouth (Nove Scotia).
For primary bibliographic entry see Field 5C.
W77-10249

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-III, EFFECTS OF OIL-SPILL EMULSIFIERS AND SURFACTANTS ON THE GROWTH OF PORPHYRA-LAVER, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10254

HEAVY METALS IN THE GASTROPOD MOLLUSC HALIOTIS TUBERCULATA (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W77-10256

HEALTH AND ECOLOGICAL ASPECTS OF COBALT-60 TRANSFER IN SEAWATER FOOD CHAIN TYPICAL OF AN INTERTIDAL MUDFLAT,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de Radioecologie.
For primary bibliographic entry see Field 5C.
W77-10257

CRITICAL THERMAL MAXIMA OF TWO SPECIES OF ESTUARINE FISH,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W77-10258

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10259

ANALYTICAL MODEL OF DISPERSION IN TIDAL FJORDS,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W77-10303

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
For primary bibliographic entry see Field 8B.
W77-10315

AUTOMATED HYDROGRAPHY FOR CHANNEL DREDGING,
Army Engineer District, Philadelphia, Pa. Survey Branch.
For primary bibliographic entry see Field 8B.
W77-10316

BREAKING WAVES,
Institute of Oceanographic Sciences, Wormley (England).
For primary bibliographic entry see Field 8B.
W77-10317

ACOUSTIC OCEANOGRAPHY,
Scripps Institution of Oceanography, La Jolla, Calif.
W. H. Munk, and G. O. Williams.
Nature, Vol. 267, No. 5614, p 774-778, June 30, 1977. 5 fig, 16 ref.

Descriptors: *Oceans, *Surveys, *Acoustics, Measurement, Monitoring, Sound waves, Water properties, On-site investigations, Fluctuations, Oceanography.
Identifiers: *Oceanic finestructure.

Measurements of ocean finestructure (with typical time scales of 15 min to 1 d, spacial scales of 10 to 100 m vertically and 1 to 10 km horizontally) are consistent with the measured variability in the transmission of acoustic signals through the ocean volume. The observations suggested that the statistics of acoustic fluctuations can be used to monitor the statistics of ocean finestructure. Further, fluctuations in the travel time are largely a measure of temperature fluctuations along the acoustic path, and the difference in reciprocal travel times is a measure of the component, along the path, of current and current shear. Such acoustic measurements give integrals along the paths, with the attendant advantages and disadvantages as compared with the traditional 'spot' measurements; precision promises to be comparable or better. (Sims-ISWS)
W77-10318

ANOXIC, HYPERSALINE BASIN IN THE NORTHERN GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. F. Shokes, P. K. Trabant, B. J. Presley, and D. F. Reid.
Science, Vol. 196, No. 4297, p 1443-1446, June 24, 1977. 3 fig, 1 tab, 11 ref.

Descriptors: *Brines, *Basins, *Gulf of Mexico, Surveys, Sampling, On-site investigations, Salinity, Oxygen, Temperature, Nitrates, Phosphates, Silicates, Chemicals, Bathymetry, Oceanography.
Identifiers: *Hypersaline basins, *Anoxic basins, *Red Sea.

A 400 sq km depression in the continental slope of the northern Gulf of Mexico (approximately 27 deg N, 91 deg W) was found to contain anoxic, hypersaline (approximately 250 g per kg) water in the bottom 200 m. The interface between the brine and overlying seawater acts as a midwater seismic reflector similar to those seen in the Red Sea. The bulk chemical composition of the brine is similar to that from the Red Sea, but differences between the two in both heat content and geomorphological setting indicate different modes of origin. (Sims-ISWS)
W77-10319

ESTIMATES OF CENOZOIC OCEANIC SEDIMENTATION RATES,
Middlebury Coll., Vt. Dept. of Geology.
T. A. Davies, W. W. Hay, J. R. Southam, and T. R. Worsley.
Science, Vol 197, No 4298, p 53-55, July 1, 1977. 1 fig, 8 ref. NSF DES74-02824, DES75-04066.

Descriptors: *Sedimentation rates, *Oceans, *Cenozoic era, *Atlantic Ocean, *Indian Ocean, *Pacific Ocean, Sedimentation, Precipitation(Atmospheric), Carbonates, Cores, Core logging, Sampling, Sediments, Climates, Climatology, Geologic history, Geology, Oceanography.
Identifiers: *Oceanic sedimentation.

Estimation of average Cenozoic sedimentation rates for the Atlantic, Indian, and Pacific oceans indicated global synchronous fluctuations. Paleocene-early Eocene and late Eocene-early Miocene rates are only a fraction of middle Eocene and middle Miocene-Recent rates. The

changes must reflect significantly different modes of continental weathering, which may be due to alternate states of atmospheric circulation marked by reduction of global precipitation. (Sims-ISWS)
W77-10320

GLOBAL MASS AND ENERGY REQUIREMENTS FOR GLACIAL OSCILLATIONS AND THEIR IMPLICATIONS FOR MEAN OCEAN TEMPERATURE OSCILLATIONS,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2B.
W77-10327

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10362

THE EFFECTS OF ORGANIC POLLUTION ON BENTHIC ORGANISMS NEAR MARSEILLE,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W77-10365

ETUDE DE LA CONTAMINATION DE CONSTITUANTS DU MILIEU MARIN PAR DES FORMES SOLUBLES ET INSOLUBLES DE RADIONUCLIDES, (STUDY OF THE CONTAMINATION OF COMPONENTS OF THE MARINE ENVIRONMENT BY SOLUBLE AND INSOLUBLE FORMS OF RADIONUCLIDES),
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
For primary bibliographic entry see Field 5C.
W77-10388

BEHAVIOUR OF CAESIUM-137 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Haifa (Israel). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10389

STUDIES ON RARE EARTH ELEMENTS IN SEAWATER AND UPTAKE BY MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5C.
W77-10390

A TRACE ELEMENT STUDY IN THE THAMES ESTUARY,
Royal Naval Coll., Greenwich, London (England). Dept. of Nuclear Science and Technology.
For primary bibliographic entry see Field 5C.
W77-10391

PLUTONIUM ISOTOPES IN AQUATIC FOODCHAINS IN THE BALTIC SEA,
Helsinki Univ., (Finland). Dept. of Radiochemistry.
For primary bibliographic entry see Field 5C.
W77-10395

EXPERIMENTAL STUDIES ON PLUTONIUM KINETICS IN MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10396

ADSORPTION-DESORPTION CHARACTERISTICS OF PLUTONIUM AND AMERICIUM WITH SEDIMENT PARTICLES IN THE ESTUARINE ENVIRONMENT, STUDIES USING PLUTONIUM-237 AND AMERICIUM-241,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10397

SOME INVESTIGATIONS INTO THE BEHAVIOR OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5C.
W77-10398

BEHAVIOR OF DISCHARGED RADIONUCLIDES FROM FUEL REPROCESSING OPERATIONS IN THE AQUATIC ENVIRONMENT OF BOMBAY HARBOUR BAY,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
For primary bibliographic entry see Field 5C.
W77-10403

UPTAKE OF COBALT-60 FROM SEA WATER AND FROM LABELLED FOOD BY THE COMMON SHRIMP CRANGON CRANGON (L),
Reactor Centrum Nederland, Petten.
For primary bibliographic entry see Field 5C.
W77-10407

HEALTH CRITERIA FOR ESTIMATING ACCEPTABLE CONTAMINATION OF COASTAL WATERS BY RADIONUCLIDES,
Ministerstvo Zdravookhraneniya SSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5B.
W77-10408

PUBLIC LAW ALLOWS MITIGATION OF SHORE EROSION DAMAGE BY CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Construction Operations Div.
For primary bibliographic entry see Field 6E.
W77-10450

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT (FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).
Naval Facilities Engineering Command, Philadelphia, Pa. Northern Div.
For primary bibliographic entry see Field 6G.
W77-10454

WETLANDS REGULATION: THE TAKING PROBLEM AND PRIVATE PROPERTY INTERESTS,
For primary bibliographic entry see Field 6E.
W77-10461

PUBLIC ACCESS TO RECEDING BEACHES,
For primary bibliographic entry see Field 6E.
W77-10462

PHOTOSYNTHETIC PROPERTIES OF MARINE BENTHIC GREEN ALGAE FROM DIFFERENT DEPTHS IN THE COASTAL AREA, (IN JAPANESE),
Tokyo Univ. of Education (Japan). Shimoda Marine Biological Station.
For primary bibliographic entry see Field 5C.
W77-10466

RED TIDE IN THE SETO INLAND SEA, (IN JAPANESE),
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
For primary bibliographic entry see Field 5C.
W77-10509

A BIBLIOGRAPHY OF ESTUARINE RESEARCH IN OREGON,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
J. B. Morgan, and R. L. Holton.
Sea Grant Publication No. ORESU-L-77-001, April 1977. 141 p, append. Also as: Oregon Estuarine Research Council Publication No. 1.

Descriptors: *Estuaries, *Bibliographies, *Oregon, Beaches, Dunes, Watershed(Basins), Drainage basins.
Identifiers: Coastal zone, Headlands.

References to published and unpublished literature pertaining to research conducted in Oregon's estuaries, their drainage basins, coastal beaches, dunes and headlands are given in this bibliography. The references are listed chronologically by author under three sections: Oregon Estuaries and their Drainage Basins; Oregon Coastal Beaches, Dunes and Headlands; and General Information on Oregon's Estuaries and their drainage basins. The bibliography also includes twelve maps of the estuaries, coastal drainage basins and headlands as well as a geographic index. (NOAA)
W77-10511

INFLUENCE OF DOMESTIC WASTES ON THE STRUCTURE AND ENERGETICS OF INTERTIDAL COMMUNITIES NEAR WILSON COVE, SAN CLEMENTE ISLAND,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W77-10512

THE PRESENT STATE AND PROBLEMS ON THE RED TIDE RESEARCH IN JAPAN, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W77-10551

ANNUAL CYCLE OF PRIMARY PRODUCTION AND ITS RELATION TO THE NUTRIENTS IN CANARY ISLAND WATERS, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain).
For primary bibliographic entry see Field 5C.
W77-10598

OBSERVATION OF OSCILLATORY ICE STATES IN A SIMPLE CONVECTION EXPERIMENT,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W77-10656

THE PHYSIOLOGICAL CHARACTERISTICS OF NERITIC RED TIDE FLAGELLATES, (IN JAPANESE),
Hiroshima Univ. (Japan). Faculty of Fishesies and Animal Husbandry.
For primary bibliographic entry see Field 5C.
W77-10686

SEASONAL CHANGE OF GROWTH PROMOTING EFFECT OF MUD EXTRACTS AND SEA WATER COLLECTED DURING VARIOUS SEASONS AT ISE BAY ON A RED TIDE

FLAGELLATE HETEROSIGMA INLANDICA HADA, (IN JAPANESE),
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10701

GYMNODINIUM TYPE-'65 RED TIDE IN OCCURRING ANOXIC ENVIRONMENT OF OMURA BAY, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10706

GROWTH OF GYMNODINIUM TYPE-'65, CAUSATIVE ORGANISM OF RED TIDE IN OMURA BAY, IN MEDIUM SUPPLIED WITH BOTTOM MUD EXTRACT,
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10707

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5C.
W77-10728

HEAVY METAL CONCENTRATIONS IN ORGANISMS FROM AN ACTIVELY DREDGED TEXAS BAY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10739

STUDIES ON THE MECHANISMS OF RED TIDE OCCURRENCE IN HAKATA BAY: II. GENERAL FEATURES OF RED TIDE FLAGELLATE, HETEROSIGMA SP., (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10740

SUMMER ZOOPLANKTON DISTRIBUTION IN A GEORGIA ESTUARY,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-10756

PHYSIOLOGICAL STUDIES OF SUBTIDAL RED ALGAE,
New Hampshire Univ., Durham. Dept. of Botany; and Jackson Estuarine Lab.
For primary bibliographic entry see Field 5C.
W77-10757

COMPARISON OF BACTERIAL AND ALGAL UTILIZATION OF ORTHOPHOSPHATE IN AN ESTUARINE ENVIRONMENT,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10760

ANALYTICAL SOLUTION FOR STEADY INTERFACE FLOW IN A COASTAL AQUIFER INVOLVING A PHREATIC SURFACE WITH PRECIPITATION,
Rijkswaterstaat, Rijswijk (Netherlands) Data Processing Div.
For primary bibliographic entry see Field 2F.
W77-10762

LEAD DISTRIBUTION IN THE CAPE FEAR RIVER ESTUARY,
Duke Univ., Beaufort, N.C. Marine Lab. and Duke Univ., Beaufort, N.C. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-10772

WIND-FORCED CONTINENTAL SHELF WAVES IN THE FLORIDA CURRENT,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
D. A. Brooks, and C. N. K. Mooers.
Journal of Geophysical Research, Vol 82, No 18, p 2569-2576, June 20, 1977. 10 fig, 2 tab, 14 ref. ONR N00014-67-A0201-0013, NSF DES72-0147 A03.

Descriptors: *Ocean currents, *Winds, *Ocean waves, *Water temperature, Sea level, On-site data collections, Data processing, Fluctuations, Continental shelf, Correlation analysis, Currents(Water), Waves(Water), Oceanography.
Identifiers: *Florida current, *Gulf Stream.

Yearlong records of sea level, oceanic temperature, winds, and atmospheric pressure provided evidence of atmospherically induced, subinertial frequency fluctuations in the Florida current. The dominant subinertial responses occurred at periods of 7-10 days in winter and 12-14 days in summer. Consistent with the theory of long stable continental shelf waves (CSW) in the Florida current, a sea level array indicated southward propagation of disturbances. The propagating disturbances had alongshore coherence scales of a few hundred kilometers and wavelengths of the order of 1000 km. The sea level and temperature fluctuations were strongly coupled, and they were coupled to both components of the wind stress. It was concluded that wind-forced southward propagating CSW's account for a significant fraction of the subinertial frequency fluctuations of the Florida current. (Sims-ISWS)
W77-10780

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

GROWTH RATE OF AN ICE CRYSTAL IN SUBCOOLED PURE WATER,
Syracuse Univ., New York. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 1A.
W77-10796

3B. Water Yield Improvement

SETTLING VELOCITIES OF SMALL ICE CRYSTALS,
Ben Gurion Univ. of the Negev, Beer Sheva (Israel). Research and Development Authority.
For primary bibliographic entry see Field 2B.
W77-10121

CLOUD SEEDING EXPERIMENTAL PROGRAM IN RHODESIA: 1974-75,
Meteorological Service, Salisbury (Rhodesia).
D. L. McNaughton.
Journal of Weather Modification, Vol. 9, No. 1, p 79-92, April 1977. 2 fig, 6 tab, 6 ref, 2 append.

Descriptors: *Weather modification, *Cloud seeding, *Africa, Precipitation(Atmospheric), Rainfall, Distribution patterns, Aircraft, Foreign countries, Data processing, Foreign research, Analytical techniques, Cloud physics, Artificial precipitation, Nucleation, Meteorology.
Identifiers: *Rhodesia.

Using randomized instructions, isolated cumulus clouds were either left alone or were seeded near cloud top from an aircraft fitted to fire pyrotechnic cartridges. The rain falling from both seeded and untreated clouds was measured at cloud base using a rainwater collector. Seeded clouds with tops warmer than about -10C gave much the same rain as similar non-seeded clouds. With colder clouds, however, the average rainfall was greater on seeded than on non-seeded occasions. When rain falling earlier than 40 min after the start of the experiment was excluded from the calculations, then the apparent bias in favor of the seeded clouds in the two-season period 1973-74-75 was significant at the 10% level. Again excluding early rain, the six heaviest falls all came from seeded clouds; the probability that this was pure chance is less than 0.04. However, there were also several seeded clouds which failed to rain. (Sims-ISWS)
W77-10306

MELTING RATES OF VARIOUS SIZE HAILSTONES IN A LARGE VERTICAL WIND TUNNEL,
State Univ. of New York at Albany. Dept. of Atmospheric Science.
S. B. Newman, and N. R. Gokhale.
Journal of Weather Modification, Vol. 9, No. 1, p 117-124, April 1977. 3 fig, 10 ref.

Descriptors: *Hail, *Melting, *Laboratory tests, Model studies, Mathematical models, Heat transfer, Temperature, Cloud physics, Precipitation(Atmospheric), Testing procedures, Meteorology.
Identifiers: *Hailstone melting, Wind tunnel tests.

Artificially made, spherical hailstones of radius 0.50-1.75 cm were suspended in the updraft of a large vertical wind tunnel and allowed to melt for time intervals of 1 to 5 min. Until now, there have been no experimental results concerning melting of large and medium sized hail. Calculations of mass and radius melting rates were made for a 1 min time interval using the equations suggested by Macklin; however, the value of chi, the heat transfer coefficient, was recomputed. Agreement between experimental and theoretical values was within 5%. In addition, melting profiles were calculated for hailstones falling from various heights. A threshold radius of 0.69 cm for stones falling from 5000 m was found to agree well with the value of 0.73 cm calculated by Ludlam for stones falling from 5400 m. (Sims-ISWS)
W77-10307

COLLECTION KERNELS FOR THE CAPTURE OF SILVER IODIDE NUCLEI BY CLOUD WATER DROPS,
Naval Weapons Center, China Lake, Calif. Earth and Planetary Sciences Div.
L. A. Matthews, and P. St.-Amand.
Journal of Weather Modification, Vol. 9, No. 1, p 125-145, April 1977. 6 fig, 44 ref.

Descriptors: *Cloud seeding, *Silver iodide, *Nucleation, Cloud physics, Clouds, Drops(Fluids), Raindrops, Model studies, Mathematical models, Thunderstorms, Precipitation(Atmospheric), Meteorology, Weather modification.
Identifiers: *Collection kernels, Collision efficiency.

Capture of AgI nuclei by cloud drops, through the microphysical processes of inertial and interceptive impaction. Brownian Diffusion, and wake capture, was expressed in terms of a collection kernel as a function of AgI nuclei and cloud drop radii. Also, the effect of phoretic forces and turbulence on the collection kernel was assessed. For the capture of 0.01 to 10 micrometers radius AgI nuclei by cloud droplets with radii 50 micrometers or greater, the collection kernels are greater than 0.000001. The kernels are large enough to bring practical concentrations of AgI into contact with

cloud drops at a rate such as to cause rapid freezing of cloud water accompanied by a large heat release if the updraft portion of a cloud is seeded. However, impractically large amounts of nuclei may be required to contact droplets in the downdraft portion of a cloud, and more so if drop evaporation is rapid and the drops are positively charged. (Sims-ISWS)
W77-10308

CHARACTERISTICS OF SILVER IODIDE ICE NUCLEI GENERATORS CURRENTLY USED BY SO.R.E.M.,
Societa' Richerche Esperienze Meteorologiche (Italy).
A. Buscaglione.
Journal of Weather Modification, Vol. 9, No. 1, p 146-153, April 1977. 5 fig.

Descriptors: *Cloud seeding, *Silver iodide, *Equipment, Nucleation, Weather modification, Rainfall, Foreign countries, Hail, Foreign research, Precipitation(Atmospheric), Generators, Meteorology.
Identifiers: *Nuclei generators, *Italy, Cloud seeding equipment, Ice nuclei.

This paper described some technical and operational characteristics of two advanced types of ground-based AgI-generators, developed and utilized at the present in Italy for both rain-enhancement and hail-prevention campaigns. The first one (S11 type), was intended for operation from a fixed station. It is a very rugged and reliable tool and can be operated by unskilled people. The second generator (type GM 10), was conceived specially for mobile operation. It is trailer-mounted and equipped for travelling stations which are connected with the operative centre by radio-link, and directed through radar-echo observations. (Sims-ISWS)
W77-10309

PRELIMINARY EVALUATION OF THE 1976 RAIN MODIFICATION PROJECT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and N. G. Towery.
Journal of Weather Modification, Vol. 9, No. 1, p 66-78, April 1977. 2 fig, 6 tab.

Descriptors: *Weather modification, *Cloud seeding, *Evaluation, *Illinois, Data collections, Analytical techniques, Rain gages, Radar, Projects, Agriculture, Precipitation(Atmospheric), Rainfall, Distribution patterns, Artificial rainfall, Meteorology.
Identifiers: Central Illinois.

The first major weather modification project in Illinois was pursued in East Central Illinois during late July-August of 1976. It related to an effort to increase summer rainfall. A group of farmers and others concerned with agricultural production in a 5-county area centered on Coles County decided to raise funds and hire a cloud seeder in an effort to increase the precipitation. This report presented first information on the background of the seeding project and the organization of the evaluation effort. Results relating to the statistical evaluation of rainfall data and radar echo data (indicative of storm and rain activity aloft) were presented. The apparent enlargement of echo and rain area in the seeded storms, as hypothesized by the seeding approach, coupled with the increase in all four rain categories, suggests that rainfall has been increased by the seeding. However, the results must be considered inconclusive due to the possible bias arising from the seeding of the more favorable storms and the lack of good time resolution of the rainfall associated with the seeded and non-seeded echoes. (Sims-ISWS)
W77-10774

AN EXAMINATION OF THE RAINFALL DISTRIBUTION OVER THE TARGET AREA OF THE COLORADO RIVER MUNICIPAL WATER DISTRICT'S WEATHER MODIFICATION PROGRAM,
Colorado River Municipal Water District, Tex.
J. Girdzus, and G. W. Bomar.
Journal of Weather Modification, Vol 9, No 1, p 93-99, April 1977. 8 fig, 3 tab, 4 ref.

Descriptors: *Weather modification, *Cloud seeding, *Texas, Artificial precipitation, Nucleation, Silver iodide, Precipitation(Atmospheric), Rainfall, Distribution patterns, Data processing, Water supply, Meteorology.
Identifiers: *Colorado River(Tex).

An analysis of available data disclosed that for the 5-year period 1971-75, the target area of the District's weather modification program received more rainfall than any other similar 5-year period since 1935. Indeed, rainfall over the target area during the seeded years was at least double that observed during any other similar 5-year period during the years 1935-70. Furthermore, rainfall increases in the target area during the seeded years were 17% greater than those of the control area for the same time period. Although the findings of the examination showed that rainfall over the target area has been increased to a greater degree than that of adjacent areas, it cannot be said with certainty that the increases are related directly to the seeding of cumulus clouds. A more substantive analysis would require a greater data resource, as well as the utilization of more sophisticated statistical analytical procedures. (Sims-ISWS)
W77-10775

3C. Use Of Water Of Impaired Quality

CHEMICAL QUALITY OF IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
National Agricultural Experiment Station, Hokkaido (Japan).
For primary bibliographic entry see Field 5B.
W77-10156

RENOVATED WASTEWATER AS A SUPPLEMENTARY SOURCE FOR MUNICIPAL WATER SUPPLY: AN ECONOMIC EVALUATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
R. M. Clark, J. I. Gillean, and K. Adams.
1976. 113 p, 58 fig, 25 tab, 7 ref, 3 append. EPA Technical Report EPA-600/1-76-033.

Descriptors: *Water reuse, *Water reclamation, *Cost comparisons, *Potable water, *Water management, Reclaimed water, Water supply, Dependable supply, Water quality, Waste water treatment, Water conservation, Municipal wastes.
Identifiers: San Diego(CA), Dallas(TX).

Growing concern and awareness about maintaining an adequate water supply for the future has led to an investigation into the feasibility of waste water reclamation and reuse for drinking water. Three alternatives for obtaining additional water were considered: (1) expansion of the existing water supply source; (2) treatment of processed waste water by an add-on reservoir renovated treatment system, dilution in existing reservoirs, and subsequent transport to the water treatment plant; and (3) treatment of processed waste water by an additional waste water treatment plant and subsequent transport to the headworks of the existing water treatment facility, bypassing the reservoir. The San Diego and Dallas Water Utilities, in areas where water supplies are needed, were chosen for consideration. Standardized costs were developed and comparisons were made between existing facilities and the three alternatives. Costs for acquisition, treatment, distribution, and other associated costs for the current water supply system were calculated. For both utilities, acquisition produced the greatest increase in cost over the existing system. Expansion of the existing water supply source was the most economical alternative for obtaining additional water. Reuse of waste water for drinking purposes may become advantageous when additional sources of potable water are limited. Reuse for agricultural purposes could be used to conserve existing supplies of drinking water. (Schulz-FIRL)
W77-10540

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10624

3D. Conservation In Domestic and Municipal Use

PROBLEMS AND POLICY ALTERNATIVES: URBAN AREAS,
Envirex, Milwaukee, Wis.
For primary bibliographic entry see Field 5G.
W77-10160

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4A.
W77-10179

EFFECT OF LAND USE MANAGEMENT ON FLOOD PREDICTIONS,
Central Shenandoah Planning District Commission, Staunton, Va.
For primary bibliographic entry see Field 4C.
W77-10181

OPTIMAL SYSTEMS OF STORM WATER DETENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W77-10184

A SANITARY ENGINEER'S VIEWPOINT ON TALL BUILDINGS,
Murray (Alex) Pty Ltd., Durban (South Africa).
For primary bibliographic entry see Field 8A.
W77-10213

EFFICIENCY IN INDUSTRIAL, MUNICIPAL AND DOMESTIC WATER USE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W77-10375

A MATHEMATICAL MODEL FOR URBAN RUNOFF,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2A.
W77-10434

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5D.
W77-10444

THE APPLICATION OF SURFACE WATER RULES IN URBAN AREAS,
For primary bibliographic entry see Field 6E.

W77-10459

ALBUQUERQUE CLOSES WATER-WASTE-WATER CYCLE.
For primary bibliographic entry see Field 5D.
W77-10633

3E. Conservation In Industry

PROBLEMS AND POLICY ALTERNATIVES: MINING,
Environmental Protection Agency, Springfield, Ill.
For primary bibliographic entry see Field 5G.
W77-10163

THE APPLICATION OF ULTRASONIC LIQUID FLOW MEASUREMENT TO THE WATER AND WASTE WATER CONTROL INDUSTRY,
For primary bibliographic entry see Field 8C.
W77-10219

COMPUTER APPLICATIONS TO ACHIEVE OPTIMUM ECONOMIC LOADING OF GENERATING PLANTS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 6A.
W77-10288

ULTRAFILTRATION--THE CURRENT STATE OF THE ART,
Abcor Environmental Systems, Ltd., Surbiton (England).
For primary bibliographic entry see Field 5D.
W77-10338

REDUCING PHOTOPROCESSING WASTES THROUGH REUSE AND RECYCLING,
Weston Environmental Consultants-Designers, New York, N.Y.
For primary bibliographic entry see Field 5D.
W77-10340

TREATING METAL FORGING AND PROCESSING WASTEWATER,
Engineering-Science, Inc., Atlanta, Ga.
For primary bibliographic entry see Field 5D.
W77-10346

SODIUM BICARBONATE TREATS ACIDIC INDUSTRIAL WASTES,
South Carolina Univ., Columbia. Environmental Engineering Program.
For primary bibliographic entry see Field 5D.
W77-10347

SOME ASPECTS OF HIGH GRADIENT MAGNETIC SEPARATION,
International Research and Development Co., Newcastle-upon-Tyne (England).
For primary bibliographic entry see Field 5D.
W77-10349

OPERATING EXPERIENCES ON PETROCHEMICALS WASTE WATER TREATMENT PLANT OF GUJARAT AROMATICS PROJECT AT JAWAHARNAGAR,
Indian Petrochemicals Corp. Ltd. Jawaharnagar (India).
For primary bibliographic entry see Field 5D.
W77-10351

REFINERY OIL/WATER SEPARATION EQUIPMENT AND ITS APPLICATIONS,
For primary bibliographic entry see Field 5D.
W77-10352

EFFICIENCY IN INDUSTRIAL, MUNICIPAL AND DOMESTIC WATER USE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W77-10375

WASTEWATER MANAGEMENT IN THE SOLID WOOD AND BOARD PRODUCTS INDUSTRIES: A REVIEW,
Mississippi State Univ., Mississippi State. Forest Product Lab.
For primary bibliographic entry see Field 5D.
W77-10690

PREVENTION OF SCALE FORMATION IN EVAPORATOR CHAMBERS (USTRANYAT' OBRAZOVANIE NAKIPI V KAMERAKH VYPARNOI STANTSII),
Krasnodarskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 5D.
W77-10691

EXAMPLE OF PLANNING FOR ENVIRONMENTAL PROTECTION (PLANUNGSBEISPIEL ZUM UMWELTSCHUTZ).
For primary bibliographic entry see Field 5D.
W77-10694

APPARATUS FOR TREATING A LIQUID USING A PERCOLATING LAYER (APPAREIL DE TRAITMENT DE LIQUIDE A COUCHE DE PERCOLATION).
For primary bibliographic entry see Field 5D.
W77-10696

DETERMINATION OF THE DEGREE OF ACCUMULATION OF RESIDUAL LIQUOR COMPONENTS DURING RECYCLING OF THE LIQUOR (OPREDELENIE STEPENI NAKOPLENIYA KOMPONENTOV POSLEDROZHZHEVOI BRAZHKI PRI VOZVRATE EE V PROIZVODSTVENNYI TSIKL),
B. I. Tokarev, D. D. Savel'ev, I. I. Balashevich, and I. E. Zuber.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 8, p 1-3, 1976. 2 fig.

Descriptors: *Fermentation, *Water reuse, *Industrial water, *Water pollution, *Yeasts, Recirculated water, Wastes, Industrial wastes, Water pollution sources, Water conservation, Water pollution control, Freshwater, Toxicity, Plant growth, Inhibitors.
Identifiers: Dilution water, Concentration(Chemical).

In the fermentation industry, the residual liquor from yeast production is recycled to partially replace fresh water for dilution of the hydrolyzates, for the preparation of chemical solutions, and for fermentation. Recycling causes gradual accumulation of the residual liquor components and must be controlled so that the concentration of the components does not reach a level inhibitory for yeast. In this report calculations are made of changes during recycling in the concentration of an inert component, i.e., a component that remains chemically unchanged during the process, and of a component the concentration of which undergoes either positive or negative change (e.g., a reaction by-product, a volatile substance, or a substance utilized by yeast). The formulas derived from these calculations can be used to determine the maximum permissible percentage of residual liquor that can be recycled and the point at which a given substance reaches the inhibitory level. (Stapinski-IPC)
W77-10697

ON THE PROPERTIES OF WASTE WATER PRODUCED IN OZONE BLEACHING OF KRAFT PULP (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
For primary bibliographic entry see Field 5A.
W77-10700

USE OF INORGANIC SORBENTS FOR THE PURIFICATION OF KRAFT MILL EFFLUENTS (PRIMENENIE NEORGANICHESKIKH SORBENTOV DLYA GRUBOKOI OCHISTKI VOD SUL'FAT-TSELLYULOZNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
For primary bibliographic entry see Field 5D.
W77-10709

GREAT LAKES PAPER (CO.) LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
For primary bibliographic entry see Field 5D.
W77-10710

DISCUSSION OF THE RAPSON CONCEPT FOR A CLOSED-SYSTEM BLEACHED KRAFT PULP MILL (BESEDA O RAPSONOVE PROJEKTU UZAVRENE VYROBY BELENE SULFATOVE BUNICINY).
For primary bibliographic entry see Field 5D.
W77-10711

SEPARATION OF FIBERS FROM PAPER MILL EFFLUENT WITH CONTINUOUSLY BACKWASHED, PRESSURIZED, LIQUID FILTER,
New York State Dept. of Environmental Conservation, Syracuse.
For primary bibliographic entry see Field 5D.
W77-10713

RAW WASTE LOADING CHARACTERISTICS AND EFFLUENT QUALITY IN THE WET PROCESS HARDBOARD MANUFACTURING INDUSTRY,
Vanderbilt Univ., Nashville, Tenn. Center for Environmental Quality Management.
For primary bibliographic entry see Field 5D.
W77-10715

PURIFICATION OF PULP MILL EFFLUENTS BY THE ACTIVATED SLUDGE METHOD USING PURE OXYGEN (WYNIKI BADAN OCZYSZCZANIA SCIEKOW CELULOZOWYCH METODA OSADU CZYNNEGO Z UZYCIEM CZYSTEGO TLENU),
Technical Univ. of Warsaw (Poland). Instytut Zaopatrzenia w Wode i Budownictwa Wodnego.
For primary bibliographic entry see Field 5D.
W77-10716

ROTATING BIOLOGICAL DISC SYSTEM,
MacMillan Bloedel Research Ltd., Port Alberni (British Columbia).
For primary bibliographic entry see Field 5D.
W77-10717

PULP MILL CONDENSATES CLEANED BIOLOGICALLY WITH THE AID OF BARK (MASSAFABRIKERNAS KONDENSATVATTEN RENAS BIOLOGISKT MED HJALP AV BARK).
For primary bibliographic entry see Field 5D.
W77-10719

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 2. DIFFERENT SEQUENCES FROM PREBLEACHING OF PINE AND BIRCH KRAFT PULP,
Swedish Forest Products Research Lab. Stockholm.

For primary bibliographic entry see Field 5A.
W77-10723

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. (PART 3). COAGULATION MECHANISM OF LIGNIN (IN JAPANESE),
Tokyo Univ. (Japan).
For primary bibliographic entry see Field 5D.
W77-10761

3F. Conservation In Agriculture

PROBLEMS AND POLICY ALTERNATIVES: AGRICULTURE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-10161

THE EFFECTIVENESS OF A MIST VERSUS A LOW PRESSURE SPRINKLER SYSTEM FOR BLOOM DELAY,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. W. Wolfe, P. B. Lombard, and M. Tabor.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 510-513, Special Edition 1976. 4 fig, 2 tab, 7 ref.

Descriptors: *Orchards, *Oregon, *Sprinkler irrigation, Sprinkling, Irrigation effects, Irrigation practices, Irrigation, Fruit crops.
Identifiers: *Bloom delay, *Pears, *Mist irrigation.

Tests were made on a fogging or misting system installed for bloom delay in a pear orchard at Medford, in comparison with a system using small sprinklers. Conclusions include: (1) A misting system provided greater cooling for bloom delay than a low-pressure sprinkler system when the water application rate was about 3 1/s ha (19 gpm per acre). (2) A bloom delay of 11 days was observed in Bartlett trees and 9 days in Bosc under the mist system tested during a late season. To obtain more delay during an early season would likely require running the system more hours. (3) The mist system required only about 60 percent as much water per day of delay as the sprinklers did. (4) A mist-system capacity of 3 1/s ha provided almost as many degrees of cooling on a day when the maximum air temperature was 10.6 C (51 F) as on a much warmer day, suggesting that the cooling efficiency for this system had nearly reached its maximum at 10.6 C (51 F). (5) The mist system is easier to install on established hedgerows than on large trees and appears to function at least as well there. (6) The capacity of the mist system tested was less than one third the capacity of many permanent overhead sprinkler systems used for frost control by encasing the trees in ice. (7) More research is needed to develop criteria for an economical system design for mist including determining the minimum required system capacity, the optimum (minimum) pressure required for adequate breakup of drops, a satisfactory filtration system, and the least elaborate layout for placing the mist uniformly on the trees. (Skogerboe-Colorado State)
W77-10165

A WATER SPRINKLER FOR ARBITRARILY SHAPED AREAS,
Westinghouse Electric Corp., Sunnyvale, Calif.
O. Burgdorf, and J. M. Henderson.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 704-707, Special Edition 1976. 9 fig, 2 tab, 2 ref.

Descriptors: *Sprinkling, *Sprinkler irrigation, Irrigation, Irrigation systems, *Irrigation practices, Winds, Uniformiy coefficient.

The concept of watering arbitrary areas from a single moving nozzle shows reasonable promise. The average 28 percent distribution error reflects an acceptable trade-off required to gain a 13.72 m (45 ft) range capability with 0.172 MPa (25 psi) water pressure. This project has given visibility to factors important to the continuation of design of sprinklers for watering arbitrarily shaped areas: (1) trade-off considerations between coherent flow (low range, harsh water impact and high uniformity) and highly dispersed flow (higher range, soft impact and lower uniformity); (2) kinematic limitations inherent in simple devices which depend solely on water pressure for system motion and control; (3) wind influence; (4) mechanisms for perimeter specification; and (5) optimization techniques which allow synthesis of control mechanisms for best available distributions. The concept offers potential for certain agricultural applications. For example, adjacent square patterns could prove more cost effective than overlapping rotational systems. It is necessary to seek alternate designs which keep the nozzle (or nozzles) at relatively low elevation angles to minimize wind effects. (Skogerboe-Colorado State)
W77-10166

WIND EFFECTS ON WATER APPLICATION PATTERNS FROM A LARGE, SINGLE NOZZLE SPRINKLER,
Agricultural Research Service, Morris, Minn. North Central Region; and Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
H. Schull, and A. S. Dylla.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 501-504, Special Edition 1976. 4 tab, 7 ref.

Descriptors: *Sprinkling, *Sprinkler irrigation, Winds, Uniformity coefficient, Irrigation, *Irrigation practices, Irrigation effects, Irrigation systems.
Identifiers: Sprinkler tests, *Wind effects(Irrigation).

A study was conducted to determine the effects of wind on the water application pattern for a stationary, single nozzle, gun type irrigation sprinkler. The effects of wind on application uniformity were determined by comparison of the wind-affected application patterns with calculated no-wind patterns. Deviation of the measured patterns from the no-wind patterns increased as wind velocity increased. Stationary application patterns were used to calculate the water distribution if the same sprinkler were traveling down lanes in a field. The calculated distributions from a traveling sprinkler were then overlapped with different travel lane spacings, and the Christiansen coefficient of uniformity value determined for each spacing. A regression equation was developed to give maximum travel lane spacing to obtain a coefficient of uniformity value of 0.85 as a function of wind conditions and water pressures. Both wind velocity and water pressure at the sprinkler elbow influence the water distribution. Also, for a traveling gun, wind direction relative to travel direction provides an additional affect; as the wind direction more nearly approaches the travel direction land spacing must be decreased to maintain acceptable application uniformity. (Skogerboe-Colorado State)
W77-10167

EFFECTIVE PRECIPITATION OF VARIOUS APPLICATION DEPTHS,
Agricultural Research Service, Fort Collins, Colo.
D. F. Heermann, and H. H. Shull.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 708-712, Special Edition 1976. 8 fig, 3 tab, 21 ref.

Descriptors: Lysimeters, Rainfall, *Rain, Evapotranspiration, *Water requirements, *Crop production.
Identifiers: *Irrigation scheduling.

Irrigators have always questioned how effective small rains and light irrigations are in meeting crop water requirements. Data from precision weighing lysimeters indicated that very small rains offset the normal water use by the plants and, therefore, very effectively meet crop water requirements. (Skogerboe-Colorado State)
W77-10168

DEEP PERCOLATION IN A FURROW-IRRIGATED SANDY SOIL,
Agricultural Research Service, Lincoln, Nebr.
C. L. Linderman, L. N. Mielke, and G. E. Schuman.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 250-253, Special Edition 1976. 6 fig, 1 tab, 20 ref.

Descriptors: *Deep percolation, *Furrow irrigation, *Sands, Irrigation, Irrigation effects, Fertilization, Irrigation practices.

Irrigating sandy soils with shallow water tables creates a potential for deep percolation losses of water and nitrogen and consequently, nitrate pollution of groundwater. The amount and nitrate content of percolate was measured with eight vacuum extractors buried below the root zone in a sandy, furrow-irrigated cornfield. Total irrigation-season percolation was 17.6 cm, which was 25 percent of the water leaving the root zone. The maximum percolation rate was over 0.37 cm/day when the corn root system was not yet fully developed and when heavy rainfall followed irrigating. More frequent irriations with smaller amounts of water should reduce percolation. Percolation of nitrate-nitrogen was 2.5 kg/ha/cm of percolate when N (67 kg/ha) was applied in slution in the irrigation water and 3.0 kg/ha/cm of percolate when anhydrous ammonia N (90 kg/ha) was sidedressed. Percolation of nitrate-nitrogen was affected more by total deep percolation of water than by the method of fertilizer application. (Skogerboe-Colorado State)
W77-10169

SIMULATING OVERLAND FLOW IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
D. L. Bassett, and D. W. Fitzsimmons.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 666-671, Special Edition 1976. 3 fig, 2 tab, 15 ref.

Descriptors: *Border irrigation, *Surface irrigation, *Overland flow, *Simulation analysis, Mathematical models, Model studies, Irrigation, Irrigation systems.

A mathematical model of the border irrigation process is introduced. It is based on the complete equations of continuity and momentum for unsteady, spatially varied flow in open channels. The equations are solved approximately by the method of characteristics. Simulated irrigations are compared to test data. Agreement between simulated and observed data is generally satisfactory. Applications of the model are suggested. (Skogerboe-Colorado State)
W77-10170

NATIONAL AND INTERREGIONAL MODELS OF LAND USE, WATER ALLOCATION, SOIL LOSS CONTROL, AND AGRICULTURAL POLICY,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 6A.
W77-10171

FIELD EVALUATION OF 102-MM (4-INCH) CORRUGATED POLYETHYLENE TUBING,
Soil Conservation Service, Broomal, Pa. Dept. of Water Management Engineering.
For primary bibliographic entry see Field 8G.

W77-10172

THE RESISTANCE OF INTACT MAIZE ROOTS TO WATER FLOW,
University of New England, Armidale (Australia). Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 2G.
W77-10271

PHOSPHORUS SORPTION AND DESORPTION CHARACTERISTICS OF SOIL AS AFFECTED BY ORGANIC RESIDUES,
Idaho Univ., Moscow. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 2G.
W77-10275

HIGH-FREQUENCY IRRIGATION FOR WATER NUTRIENT MANAGEMENT IN HUMID REGIONS,
Agricultural Research Service, Florence, S.C. Coastal Plains Soil and Water Conservation Research Center.
C. J. Phene, and O. W. Beale
Soil Science Society of America Journal, Vol 40, No 3, p 430-436, May-June 1976. 8 fig, 2 tab, 16 ref.

Descriptors: Subsurface irrigation, *Irrigation systems, Irrigation, *Irrigation effects, Nutrients, Humid climates, *Humid areas, Soil water, Fertilization, Crop response, Corn(Field), Furrow irrigation, Sprinkler irrigation, Leaching, Crop production.
Identifiers: Trickle irrigation, Drip irrigation.

A water-nutrient management method was designed to prevent plant-water and nutrient stresses while maximizing the available soil water storage to accomodate rainfall. This method minimized the need for the soil as a storage reservoir for water and nutrients by frequently irrigating a portion of the root zone with small amounts of water and nutrients. The optimal range of soil matric potential, based on soil oxygen diffusion rate, soil strength, water desorption characteristics, and unsaturated hydraulic conductivity was used to determine high-frequency irrigation criteria for sweet corn. Trickle-irrigated plots yielded 12 and 14% more corn than did the furrow- and sprinkler-irrigated plots. When fertilizers were broadcast and banded, soil NO3-N profiles measured near the end of the growing season showed that, compared to furrow and sprinkler irrigation, trickle irrigation reduced NO3-N losses from the root zone. (Skogerboe-Colorado State)
W77-10278

A TECHNIQUE TO DETERMINE IRON EFFICIENCY IN PLANTS,
Agricultural Research Service, Beltsville, Md. Plant Physiology Inst.
For primary bibliographic entry see Field 2G.
W77-10280

AN EVALUATION OF SULFUR-COATED UREA AS A PREPLANT TOTAL SEASON NITROGEN SUPPLY FOR TRELLISED TOMATOES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
J. E. Shelton.
Soil Science Society of America Journal, Vol. 40, No. 1, p 126-129, January-February 1976. 2 fig, 2 tab, 5 ref.

Descriptors: *Ureas, *Nitrogen, Nutrients, Fertilization, *Tomatoes, Crop response, Sampling, *Crop production.
Identifiers: *Sulfur-coated urea.

The use of a controlled release N source for the production of trellised tomatoes which require frequent topdressings would be desirable. Three sulfur-coated urea (SCU) materials having release rates of 11.4, 21.5, and 19.3% over a 7-day period were compared to NH4NO3 applied preplant or as multiple applications. Nitrogen rates were 392, 560, and 729 kg N/ha. Marketable yields from an application of SCU(11.4) at 392 or 560 kg N/ha were greater than with the same rate of N as NH4NO3 either as preplant or split applications. When SCU(21.5) or SCU(29.3) was used, the yields were comparable to a single application of NH4NO3. Differences in fruit number per plot were not significantly related to treatments. However, there was a significant difference in average fruit weight which was correlated with total yield. Tissue N content was highest at the first sampling from a single application of NH4NO3 and lowest from SCU(11.4). However, at later sampling periods the N content was maintained at a higher level with SCU(11.4). Although 729 kg N/ha as a single application of NH4NO3 detrimentally affected plant growth and production, this effect was not noted with the sulfur-coated urea materials. (Skogerboe-Colorado State)
W77-10283

INFLUENCE OF ROW SPACING AND STRAW MULCH ON FIRST STAGE DRYING,
Agricultural Research Service, Temple, Tex. Southern Region.
For primary bibliographic entry see Field 2D.
W77-10286

LAW OF PROBABILITY FOR TWO LOW WATER VARIABLES,
Direction des Eaux, Baja (Hungary).
For primary bibliographic entry see Field 2E.
W77-10297

HERE COMES THE SUN.
For primary bibliographic entry see Field 8C.
W77-10518

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5E.
W77-10579

IRRIGATION TRIAL WITH MORRO BAY WASTEWATER,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10623

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10624

QUANTIFICATION OF BENEFICIAL EFFECTS OF SPRINKLER IRRIGATION APART FROM INCREASE IN CROP YIELD, (IN GERMAN),
Deutsche Akademie der Landwirtschaftswissenschaften zu Berlin, Muencheberg (East Germany). Forschungszentrum Bodenfruchtbarkeit.
Helmut Foerkel, and Fritz Schirach.
Arch Acker-Pflanzenbau Bodenkd 19(5), p 375-382, 1975.

Descriptors: *Benefits, *Sprinkler irrigation, *Livestock, *Forage palatability, *Irrigation systems, Efficiencies, Crop response, Slurries, Nutrient requirements.
Identifiers: Livestock production.

To estimate the efficiency of sprinkler irrigation systems it is necessary to take into account the beneficial effects of sprinkler irrigation apart from the increase in crop yield. The effect on the cropping structure and the advantages to livestock production that arise from the better forage quality are of major importance. Other cost reductions in crop production are usually of minor importance. Changes in the cost of drinking water if a large part of the irrigated land is used as pasture, and slurry application through the sprinkler system as against mobile slurrying may also have some effect.
W77-10726

NEW SOLUTIONS FOR WATER RESERVOIRS IN IRRIGATION SYSTEMS FED BY THE DANUBE AND INLAND RIVERS, (IN FRENCH),
S. Hancu, V. Jeler, Lucia Predescu, and I. Vasilescu.
Bull Acad Sci Agric For 3, p 43-56, 1973.

Descriptors: *Reservoirs, *Irrigation systems, *Water supply, *Water sources, Rivers, Hydraulic models, Laboratory tests, Dams, Dam design, Damsites.
Identifiers: Danube, Romania.

Water reservoirs are of fundamental importance to the proper functioning of irrigation systems; since they depend on the characteristics of the water source and the conditions imposed by their exploitation, the planning of reservoirs requires careful study and research on hydraulic models under laboratory conditions. Such studies made to date by the collectives of the Institute for the Study of Improved Water Sources (Romania) has led to the establishment of certain types of reservoirs in free communication with the Danube and inland rivers. The investments required for such reservoirs are more modest than those of other known types. The adaptation of such types of reservoirs under specific local conditions is not possible without laboratory trials. When dams are required, laboratory studies must be focused particularly on correct placement, the layout of the project and the dimensions of the compartment construction parts.
W77-10727

A BASIC STUDY ON APPLICATION OF SYSTEMIC INSECTICIDES: V. EFFECTS OF RAINFALL ON TOXICITY OF VAMIDOTHION AND MALATHION, (IN JAPANESE),
Shionogi Co. Ltd., Shiga (Japan). Aburahi Lab.
For primary bibliographic entry see Field 5C.
W77-10737

AN ECONOMIC ANALYSIS OF IRRIGATED FARMING WITH DIMINISHING GROUND WATER RESERVES,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 4B.
W77-10748

SURFACE ROUGHNESS OF CROPS AND POTENTIAL EVAPOTRANSPIRATION,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands).
For primary bibliographic entry see Field 2D.
W77-10771

EFFECTS OF INCREASED FERTILIZER RATES ON NITROGEN CONTENT OF RUNOFF AND PERCOLATE FROM MONOLITH LYSIMETERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W77-10773

HOW ACCURATE ARE SHOP-MADE ORIFICE PLATES,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. O. Ree.

Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 298-300, March-April 1977. 3 fig, 2 tab.

Descriptors: *Irrigation, *Flow measurement, *Orifice flow, Orifices, Measurement, On-site data collections, Equipment, Gages, Flow, Irrigation ditches, Irrigation engineering, Water delivery, Irrigation efficiency.
Identifiers: *Orifice plates.

Efficient use of irrigation water may require field measurement of furrow flows. A plate with a circular orifice, together with a simple hook gage (both readily made in any sheet metal shop), can be used to measure the flows. However, the orifice may not be perfect, and its accuracy is doubtful. Tests of a sample lot of orifice plates showed that errors in flow measurement could be as large as 15% for a 2.54-cm diameter orifice. For a 8.89-cm diameter orifice, the maximum error would probably be about 2%. The errors are tolerable for rough flow measurements but not for a more accurate measurement. The head measuring technique was checked and found to be satisfactory. (Sims-ISWS)
W77-10782

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SIMULATING OVERLAND FLOW IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W77-10170

FIELD EVALUATION OF 102-MM (4-INCH) CORRUGATED POLYETHYLENE TUBING,
Soil Conservation Service, Broomal, Pa. Dept. of Water Management Engineering.
For primary bibliographic entry see Field 8G.
W77-10172

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8B.
W77-10176

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
R. F. Wiseman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 617, Price codes: A04 in paper copy, A01 in microfiche. KWWRI Contribution No 189, April 1977. 57 p, 27 fig, 1 tab, 125 ref. OWRT A-072-KAN(1). 14-31-0001-5016.

Descriptors: *Flood plains, *Land use, *Kansas, Urbanization, Cities, Floods, Flood control, *Flood forecasting, Flood frequency.
Identifiers: *Urban development, *Flood risk, Urban morphology, *Flood probability level.

This study presents a descriptive analysis of urban land use development on flood plain areas within Wichita, Kansas. The principal data source is building permits and tax records which identify the number of square feet of floor space constructed, year of construction and land use type. Aggregated to the census block level, construction rates for five year periods from 1941 to 1970 are compared across flood probability levels. A discussion of the major theories of urban morphology is supported by examination of the data documenting Wichita's development during the period 1900 to 1970. Analysis of relationships between this development and the flood risk potential as measured by flood probability reveals the following. During periods when there is moderate pressure for urban growth, developers are reluctant to build on land which has a flood probability greater than one flood per ten years. This reluctance has diminished over the past several decades and is totally non-existent during periods of strong pressure for urban growth. In fact, the period of greatest growth pressure witnessed more construction in two year flood probability areas than in areas with lower flood risk. This situation and the spatial nature of urban development over time result in the development of all areas regardless of flood risk. A history of recent, significant floods does not impede urban construction. This is particularly true of industrial and residential land uses and less typical for commercial development.
W77-10179

EFFECT OF LAND USE MANAGEMENT ON FLOOD PREDICTIONS,
Central Shenandoah Planning District Commission, Staunton, Va.
For primary bibliographic entry see Field 4C.
W77-10181

OPTIMAL EXPANSION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT: VOLUME I),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 6F.
W77-10263

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-10267

CONTROL OF ALGAE IN LAKES, LAGOONS AND SMALL RESERVOIRS WITH BIOGROWTH PARTITIONS,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-10268

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2E.
W77-10296

THE USE OF MATHEMATICAL MODELS FOR FORECASTING IN HYDROLOGY AND METEOROLOGY,
Electricite de France, Grenoble. General Technical Div.
For primary bibliographic entry see Field 2A.
W77-10298

MODEL STUDIES OF DENVER WHITEWATER CHANNEL,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 8B.
W77-10304

METHOD FOR ROUGHLY ESTIMATING THE WATER EXCHANGE OF A RESERVOIR WITH AN AQUIFER HYDRAULICALLY CONNECTED WITH IT,
For primary bibliographic entry see Field 4B.
W77-10321

EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON LAMBDA = 2.1 CM,
For primary bibliographic entry see Field 7B.
W77-10322

REDUCTION OF 2, 4-D LOAD IN SURFACE RUNOFF DOWN A GRASSED WATERWAY,
Agricultural Research Service, Tifton, Ga. Southern Region.
For primary bibliographic entry see Field 5G.
W77-10323

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 6A.
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2A.
W77-10419

APPLICATION OF SOME STATISTICAL METHODS FOR THE ESTIMATION OF MINIMUM FLOW,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10420

A NEW METHOD FOR MODELLING MONTHLY DISCHARGE SERIES,
Research Inst. for Water Resources Development, Budapest (Hungary).
M. Kardos.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 122-129, 1975. 3 fig, 7 ref.

Descriptors: *Model studies, *Statistical methods, *Runoff, *Simulation analysis, Mathematical models, Discharge(Water), Watersheds(Basins), Synthetic hydrology, Analytical techniques, Markov processes, Stochastic processes, Monthly, Annual, Variability, Random number, Synthesis, Foreign research, Time series analysis.
Identifiers: *Hungary, *Danube River(Hungary), *Tisza River(Hungary).

The most widespread methods for generating long discharge series relating to several hundred years, which are necessary for the efficient operation of simulation models generally used in modern water management systems, are mainly mathematical models based on the Monte Carlo method. The basic idea of the models is to take the time functions of discharges as stochastic processes about which we know one realization in the past. Assuming that some future statistical properties of these processes will remain unchanged, elements of arbitrary long series can be generated by the use of random numbers; that is to say, so-called generated series can be constructed. The series can be taken as one of the possible realizations of the future. The generation of the series in a single section of a water course was made in two steps: first the yearly and then the monthly series were generated. A new method was developed to avoid the disadvantages of the usual methods for generating discharge series. The basic idea of the new method is the assumption that the characteristics of the discharge distributions within a year of the future will be similar to those of the past. To facilitate the judgement of the reliability

of the new method, a comparison was made of the statistical parameters of series generated by the traditional and by the new method. It was found that statistical parameters of the series generated by the new method are much closer to the same parameters of observed series than are the parameters of a series generated by the traditional method. (See also W77-10419) (Humphreys-ISWS)
W77-10425

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
G. W. Kite.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 136-142, 1975. 2 fig, 1 tab, 4 ref.

Descriptors: *Model studies, *Watersheds(Basins), *Canada, *Runoff, *Flood forecasting, Hydrographs, Hydrology, Discharge(Water), Computer models, Evaluation, Performance.
Identifiers: *Ontario(Canada), *Magpie River(Canada).

Two model studies were performed in the basin of the Magpie River in northern Ontario. The basin has an area of 1900 sq km and is situated in the Canadian Shield of Pre-Cambrian rock. The river has a length of just over 90 km and falls approximately 330 m before entering Lake Superior. The soil cover is a mixture of productive forest and nonproductive swamp forest. The results from a simple basin model, (Water Resources Branch) with a few parameters and an automatic optimization scheme were compared to the results of the larger and more complex 'Streamflow Synthesis and Reservoir Regulation (SSARR) model. While the small model obviously does not have the versatility and range of application of the larger models, it can be easily and quickly applied to basins without a large amount of data. Comparisons were carried out using 12 months daily data for calibration of the models and 12 months data for verification. The simpler WRB model gave results which were statistically at least equal to those of the more complex SSARR model. The results from the WRB model can be used to indicate those components of the hydrological cycle important in a study basin. The information then can be used to reduce the number of trial-and-error computer runs for models such as SSARR. (See also W77-10419) (Humphreys-ISWS)
W77-10426

STATISTICAL MODELLING OF RIVER FLOW BY THE MONTE CARLO METHOD AND EVALUATION OF DISTRIBUTION PARAMETERS AND QUANTITIES,
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W77-10433

A MATHEMATICAL MODEL FOR URBAN RUNOFF,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
For primary bibliographic entry see Field 2A.
W77-10434

STOCHASTIC PROPERTIES OF THE PROCESSES TRANSFORMED IN LINEAR HYDROLOGICAL SYSTEMS,
Polish Academy of Sciences, Warsaw. Inst. of Geophysics.
For primary bibliographic entry see Field 2A.
W77-10436

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2A.
W77-10437

A MATHEMATICAL MODEL OF FLOOD WAVES MOVING ALONG A CASCADE OF RESERVOIRS ON A LARGE RIVER,
Ukrainskii Nauchno-Issledovatelskii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 2E.
W77-10438

STRUCTURE OF NATURAL HYDROLOGIC TIME PROCESSES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10440

LONG-RANGE CHANGES,
Department of the Environment, Ottawa (Ontario). Inland Water Directorate; Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2A.
W77-10443

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT (FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).
Naval Facilities Engineering Command, Philadelphia, Pa. Northern Div.
For primary bibliographic entry see Field 6G.
W77-10454

WATERS OF THE UNITED STATES: DOES FEDERAL CONTROL INUNDATE THE WETLAND (COMMENT ON US V HOLLAND),
For primary bibliographic entry see Field 6E.
W77-10463

FLORIDA'S LAND USE RESTRICTIONS: ARE THEY SERVING THE PUBLIC INTEREST,
For primary bibliographic entry see Field 6E.
W77-10465

COASTAL ZONE MANAGEMENT INVOLVING THE BOUNDARY WATERS OF NEW YORK AND ONTARIO,
For primary bibliographic entry see Field 6E.
W77-10469

FEDERAL AND STATE CONTROLS OVER LAND/WATER DEVELOPMENT IN NAVIGABLE AND NON-NAVIGABLE WATERS,
For primary bibliographic entry see Field 6E.
W77-10470

MODEL FOR EVALUATING THE EFFECTS OF DIKES ON THE WATER AND SALT BALANCE OF GREAT SALT LAKE, UTAH,
Geological Survey, Salt Lake City, Utah. Water Resources Div.
For primary bibliographic entry see Field 2H.
W77-10563

THE PREDICTION OF THE RAINFALL-RUNOFF BEHAVIOR IN URBAN AREAS (ZUR PROGNOSE DES NIEDERSCHLAG-ABFLUSS-VERHALTENS IN URBANEN EINZUGSGEBIETEN),
W. Neumann.
Wasserwirtschaft, Vol. 67, No. 4, p 89-93, April, 1977. 9 fig, 10 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Urban areas, Flow, Surface runoff, Precipitation(Atmospheric), Urban runoff, Slopes, Overland flow, Physical properties.

A model for the prediction of urban rainfall-runoff relationships was presented. A division into surface and channel systems was necessary, and an overland flow model was especially important regarding the transfer of areal characteristics. A single linear reservoir model suffices if the parameter is based on specific area characteristic values. Variables considered included length of flow, roughness of area surface, and slope. Rainfall intensity influences were necessarily considered in the nonlinear rainfall-runoff process. The model provided practical solutions to this problem. (Collins-FIRL)
W77-10581

URBAN RUNOFF AND COMBINED SEWER OVERFLOW,
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
R. Field, R. Bowden, and K. Rozgonyi.
Journal Water Pollution Control Federation, Vol 49, No 6, p 1095-1104, June, 1977. 116 ref.

Descriptors: *Storm runoff, *Storm drains, *Combined sewers, *Urban runoff, *Infiltration, Mathematical models, Hydrologic studies, Overflow, Flow control, Flow measurement, Runoff, Urban runoff, Urban hydrology, Waste water treatment, Water Pollution Control Federation.

A literature review is presented of the various aspects related to the control and treatment of storm water discharges and combined waste water overflows from urban areas. Various methods for determining the quantity and quality of urban runoff are discussed, including descriptions of field and laboratory studies. Hydrologic studies and mathematical models for simulation of storm and combined sewer systems are considered for urban watershed management. The use of infiltration-flow analysis and flow meters is outlined for sewer system management and evaluation. Previous studies of construction costs for combined sewer overflow treatment plants and erosion control programs are described. (Schulz-FIRL)
W77-10600

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
T. B. Debo, and B. O. Ulrich.
Public Works, Vol. 108, No. 7, p 60-62, July, 1977. 3 fig.

Descriptors: *Storm runoff, *Stream bank erosion, *Surface runoff, *Stream flow, *Flood routing, Sedimentation, Erosion control, Planning, Model studies, Hydrologic models, Storm water, Urbanization, Urban drainage.
Identifiers: Columbus(GA), Columbus Storm Water Management Program(CSWMP).

Urbanization and changes in land use have substantially altered the natural drainage and vegetation patterns in the area of Columbus, Georgia. Construction in previously undeveloped areas has led to increased surface runoff, sedimentation, stream-flow, and stream bank erosion. The Columbus Storm Water Management Program (CSWMP) was designed to establish guidelines and procedures to alleviate flooding, erosion, and sedimentation and to protect existing natural areas. New computer techniques are used to augment traditional methods. The first phase of the three phase program included a comprehensive soils inventory and analysis to supplement existing data. The goal of the second phase was to conduct

hydrologic studies and to develop a comprehensive erosion and sediment control program. Third phase of the program includes implementation of a two-part urban flood simulation model. The first component of the model generates flood hydrographs and frequency estimates, while the second component evaluates alternative flood mitigation measures using local physical characteristics and economic data. (Schulz-FIRL)
W77-10612

THE APPLICATION OF HYDROMETEOROLOGICAL DATA OBTAINED BY REMOTE SENSING TECHNIQUES FOR MULTIPURPOSE RESERVOIR OPERATIONS,
Salt River Project, Phoenix, Ariz.
W. L. Warskow, T. T. Wilson, Jr., and K. Kidar.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 29-37, 1975. 4 ref.

Descriptors: *Remote sensing, *Snow cover, *Reservoirs, *Arizona, Satellites(Artificial), Projects, Snowpacks, Snowmelt, Runoff, Watersheds(Basins), Rivers, Mapping, Water resources, Water management(Applied), Hydrology, Meteorology.

Watershed snowpack and streamflow data obtained and transmitted by (ERTS) satellite has been used in the operational and water management decisions in the Salt River Project. Located in central Arizona, the Project provides water and electric power for the more than 1.1 million residents of the Salt River Valley. The water supply source is a 33,670 sq km watershed and 250 deep well pumps. Six storage reservoirs, four of which have hydroelectric capability, located on two river systems have a storage capacity of over 246,600 hectare-metres (2,000,000 AF.). Information from the watershed during the normal runoff period of December to May and more especially during critical periods of high runoff and minimum reservoir storage capacity is necessary for the reservoir operation regimen. Extent of the snowpack, depth of snow, and the condition of the pack has been observed and reported by an observer in aerial flights over the watershed. Snow density, air temperature, accumulated precipitation, and streamflow quantities have been relayed by satellite data collection stations. The data, along with bi-weekly snow surveys, have been the bases for runoff volume forecasts and for the development of the reservoir operations plan. The application of snow mapping techniques from satellite imagery which can provide frequent definition of the areal extent of watershed snow cover holds good potential for improved accuracy of the volume forecasts as well as providing needed information for the day to day critical operational decisions. (See W77-10662) (Sims-ISWS)
W77-10664

INTERPRETATION OF SNOWCOVER FROM SATELLITE IMAGERY FOR USE IN WATER SUPPLY FORECASTS IN THE SIERRA NEVADA,
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
A. J. Brown, and J. F. Hannaford.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 39-51, 1975. 3 fig.

Descriptors: *Remote sensing, *Snow cover, Water resources, *California, Satellites(Artificial), Watersheds(Basins), Snowpacks, Mountains, Snowmelt, Runoff, Rivers, Reservoirs, Water supply, Water management(Applied), Forecasting, Data processing, *Forecasting.
Identifiers: *LANDSAT data, *Sierra Nevada.

The California Applications Systems Verification Test (ASVT) test area is composed of two study areas; one in Northern California covering the Upper Sacramento and Feather River Basins, and the other covering the Southern Sierra Basins of the San Joaquin, Kings, Kaweah, Tule, and Kern Rivers. The paper described the experiences of reducing snowcover from satellite imagery, the accuracy of present water supply forecast schemes, and the potential operational advantages of introducing snowcover into the forecast procedures. (See also W77-10662) (Sims-ISWS)
W77-10665

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS IN RIO GRANDE DRAINAGE OF COLORADO,
Soil Conservation Service, Denver, Colo.
J. N. Washicheck, and T. Mikesell.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 53-69, 1975. 7 fig.

Descriptors: *Remote sensing, *Snow cover, *Rio Grande River, *Colorado, Satellites(Artificial), Watersheds(Basins), Rivers, Streamflow, Forecasting, Snow, Snowpacks, Snowmelt, Runoff, Forests, Mountains, Clouds, Mapping, Data processing, Hydrology.
Identifiers: *LANDSAT data.

It is hoped that snowcover as determined from satellite pictures can be used in streamflow forecasting. An improvement in forecasting is an improvement in management. Various mapping techniques were tried and evaluated. There were many problems encountered such as distinguishing clouds from snow and snow under trees. A partial solution to some of the problems involves ground reconnaissance and low air flights. Some problems go unanswered. Snow areas, cloud cover, and total areas were planimetered after transferring imagery by use of zoom transfer scope. The determinations were then compared to areas determined by use of a density slicer. Considerable adjustment is required for the two values to compare. NOAA pictures also were utilized in the evaluation. Forest cover is one of the parameters used in the modeling process. The determination of the percentage is being explored. (See also W77-10662) (Sims-ISWS)
W77-10666

THE OPERATIONAL PROGRAM OF SATELLITE SNOWCOVER OBSERVATION AT NOAA/NESS.
National Environmental Satellite Service, Washington, D.C.
S. R. Schneider.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 87-101, 1975. 5 fig, 2 tab, 9 ref.

Descriptors: *Remote sensing, *Snow cover, *Watersheds(Basins), Satellites(Artificial), Rivers, Snowpacks, Snow, Snowmelt, Runoff, Mapping, Data processing, Quality control, Water resources, Hydrology, *River basins.
Identifiers: *GEOS data.

NOAA's National Environmental Satellite Service (NESS) has been producing satellite derived areal snow cover maps for selected river basins during the past three snow seasons. The project began in the Spring of 1973 with four basins originally targeted for study. The basins were selected so as to provide a variety of topographic, spatial, and climatological characteristics. The subject areas included the American River basin in California, the Williamette River basin in Oregon, the Red River of the North basin in North Dakota and Minnesota, and two sub-basins of the Genesee River in New York. An increase in manpower resources and the procurement of an electronic planimeter has enabled NESS to expand this successful program. Operational coverage is now being provided for 18 basins in the United States as well as several in Canada. The operational river basin snow mapping program at NESS was described, with emphasis on quality control techniques and results for the 1974-1975 snow season. (See also W77-10662) (Sims-ISWS)
W77-10668

USE OF AREAL SNOW COVER MEASUREMENTS FROM ERTS-1 IMAGERY IN SNOWMELT-RUNOFF RELATIONSHIPS IN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2C.
W77-10669

UTILIZATION OF LANDSAT MONITORING CAPABILITIES FOR SNOWCOVER DEPLETION ANALYSIS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W77-10670

OPERATIONAL APPLICATIONS OF NOAA-VHRR IMAGERY IN ALASKA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. D. Seifert, R. F. Carlson, and D. L. Kane.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 143-155, 1975. 6 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Snow cover, *Floods, *Alaska, Satellites(Artificial), Runoff, Streamflow, Flood forecasting, Mapping, Snowpacks, Snow, Snowmelt, Ice, Ice jams, Water temperature, Watersheds(Basins), Hydrology.

A discussion of near-real time operational applications of NOAA satellite-enhanced thermal infrared imagery to snow monitoring for river forecasts, and a photographic overlay technique of imagery to enhance snowcover were presented. Ground truth comparisons show a thermal accuracy of approximately + or - 1C for detection of surface radiative temperatures. The application of NOAA imagery to flood mapping also was presented. (See also W77-10662) (Sims-ISWS)
W77-10672

EMPLOYMENT OF SATELLITE SNOWCOVER OBSERVATIONS FOR IMPROVING SEASONAL RUNOFF ESTIMATES,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
A. Rango, V. V. Salomonson, and J. L. Foster.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 157-174, 1975. 8 fig, 2 tab, 11 ref. NOAA/NESS NA-776-74.

Descriptors: *Remote sensing, *Snow cover, *Wyoming, *Runoff, Satellites(Artificial), Watersheds(Basins), Rivers, Streamflow, Snowpacks, Snowmelt, Melt water, Seasonal, Mapping, Hydrology.
Identifiers: *Indus River(Pakistan), *Wind River(Wyo), *LANDSAT data.

Low resolution meteorological satellite and high resolution earth resources satellite data have been used to map snowcovered area over the upper Indus River and the Wind River Mountains of Wyoming, respectively. For the Indus River, early Spring snowcovered area was extracted and related to April through June streamflow from 1967-1971 using a regression equation (r sq = 0.91). Pre-

diction of the April-June 1972 streamflow from the satellite data was within three % of the actual total. Composited results from 2 years of data over 7 Wind River Mountain watersheds indicated that LANDSAT-1 snowcover observations, separated on the basis of watershed elevation, also could be related to runoff in significant regression equations. It appears that earth resources satellite data will be useful in assisting in the prediction of seasonal streamflow for various water resources applications, in non hazardous collection of snow data from restricted-access areas, and in hydrologic modeling of snowmelt runoff. (See also W77-10662) (Sims-ISWS)
W77-10673

APPLICATIONS OF SATELLITE SNOW COVER IN COMPUTERIZED SHORT-TERM STREAMFLOW FORECASTING,
C. F. Leaf.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 175-186, 1975. 5 fig, 3 tab, 7 ref.

Descriptors: *Remote sensing, *Snow cover, *Colorado, *Runoff, Satellites(Artificial), Model studies, Mathematical models, Computer models, Streamflow, Snowpacks, Snow, Snowmelt, Rivers, Watersheds(Basins), Hydrology, Rio Grande River.
Identifiers: *Conejos River(Colo), *Rio Grande River Basin.

A procedure was described whereby the correlation between: (1) satellite derived snow-cover depletion, and (2) residual snowpack water equivalent, can be used to update computerized residual flow forecasts for the Conejos River in southern Colorado. (See also W77-10662) (Sims-ISWS)
W77-10674

NEW SOLUTIONS FOR WATER RESERVOIRS IN IRRIGATION SYSTEMS FED BY THE DANUBE AND INLAND RIVERS, (IN FRENCH),
For primary bibliographic entry see Field 3F.
W77-10727

DRAWDOWN ANALYSIS OF SLOPES BY NUMERICAL METHOD,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-10776

STABILIZATION OF POTENTIALLY LIQUEFIABLE SAND DEPOSITS USING GRAVEL DRAINS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-10777

SEQUENT PEAK PROCEDURE: MINIMUM RESERVOIR CAPACITY SUBJECT TO CONSTRAINT ON FINAL STORAGE,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
K. W. Potter.
Water Resources Bulletin, Vol 13, No 3, p 521-528, June 1977. 1 fig, 2 ref, append.

Descriptors: *Reservoirs, *Peak loads, *Peaking capacity, Peak discharge, Reservoir design, Reservoir operation, Reservoir storage, Reservoir yield, Storage, Cycles, Withdrawal, Equations.
Identifiers: *Sequent peak procedure, Reservoir capacity, Final storage, Cycles of inflow, Design inflow, Design drafts.

When the sequent peak procedure is used to size a reservoir, two cycles of inflows and drafts are analyzed. The use of two cycles results in the identification of the minimum reservoir capacity which, when simulated with the design inflows and drafts, will not only meet demands, but also results in a final storage which equals or exceeds the initial storage. Demonstration of optimality follows from consideration of a method which is equivalent to the sequent peak procedure. It was shown that the use of two cycles in the sequent peak procedure results in the identification of the minimum reservoir capacity which, when simulated with the design inflows and drafts, not only meets demands but also results in a fatal storage greater or equal to the initial storage. To demonstrate that the use of two cycles constrains final storage, it was shown that the two cycle results can be obtained simply from one cycle only. (Roberts-ISWS)
W77-10781

HOW ACCURATE ARE SHOP-MADE ORIFICE PLATES,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 3F.
W77-10782

SOME REMARKS ON THE STATISTICAL THEORY OF EXTREME VALUES,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 2A.
W77-10786

HYDRAULIC MODELING OF MIXING IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-10798

4B. Groundwater Management

EFFECTS OF ARTIFICIALLY INTRODUCED GROUND WATER ON THE CHEMICAL AND BIOCHEMICAL CHARACTERISTICS OF SIX HILLSBOROUGH COUNTY (FLORIDA) LAKES,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 2H.
W77-10139

IMPACT OF LEGAL CONSTRAINTS ON GROUND-WATER RESOURCE DEVELOPMENT IN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W77-10173

INFLUENCE OF ORGANIC CARBON AND MICROORGANISMS ON IRON AND SULFIDE CONCENTRATIONS IN GROUNDWATER,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-10183

TRITIUM IN THE MONITORING OF WATER SUPPLY.
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W77-10196

RECOMMENDATIONS FOR THE ROUTINE RECORDING OF BOREHOLE DATA FOR HYDROGEOLOGICAL PURPOSES,
National Physical Research Lab., Pretoria (South Africa).
P. F. Worthington, and E. Martinelli.
South African Journal of Science, Vol. 72, No. 8, p 229-232, August 1976. 2 tab, 16 ref.

Descriptors: Groundwater resources, Evaluation, *Well data, *Water wells, Boreholes, Hydrologic data, *Hydrogeology.
Identifiers: South Africa.

The first stage of any detailed investigation of groundwater resources involves an appraisal of existing hydrogeological data. Unfortunately this procedure is often complicated by the incompleteness and lack of uniformity of the available information. Generalized standard recommendations are presented concerning the routine recording of hydrogeological data which are sufficiently comprehensive to form a useful basis for future detailed studies of groundwater resources. (So African Water Info Center)
W77-10224

EFFECT OF VISCOSITY RATIO ON THE RECOVERY OF FRESH WATER STORED IN SALINE AQUIFERS,
Louisiana Water Resources Research Inst., Baton Rouge.
O. K. Kimbler, and W. R. Whitehead.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 780, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April 1977. 33 p, 5 fig, 6 tab, 6 ref, 3 append. OWRT A-037-LA(1), 14-34-0001-6019.

Descriptors: Groundwater recharge, *Water storage, *Injection wells, Recharge wells, Hydraulics, Artificial recharge, *Aquifers, *Viscosity.
Identifiers: *Saline aquifers.

Differences in viscosity between injected and displaced fluids will always result in a lower recovery efficiency during underground water storage in aquifers than would have been realized had the viscosities been equal. This result arises from (1) increased dispersion and (2) viscous fingering (gross frontal irregularities). Experimental studies involving injection and subsequent production from single wells in two physical flow systems (miniaquifers) suggest the following conclusions: (1) The recovery efficiency is a maximum where the fluid viscosities are equal; (2) from an engineering point of a view, the recovery efficiency is approximately the same for a fixed viscosity difference irrespective of whether injected or native water is the more viscous; (3) a computational procedure previously developed for a viscosity of unity is applicable for a non-unity viscosity ratio provided an effective dispersivity is used which has been obtained from an injection/production well test; and (4) dispersivity coefficients obtained from the production profile of an observation well rather than the injection well represent highly unrealistic values and if used in the computational procedure will yield false values of recovery efficiency.
W77-10264

METHOD FOR ROUGHLY ESTIMATING THE WATER EXCHANGE OF A RESERVOIR WITH AN AQUIFER HYDRAULICALLY CONNECTED WITH IT,
I. B. Vol'ftsun.
Soviet Hydrology, Selected Papers, Issue No. 4, p 213-215, 1975. 1 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 226, p 104-110, 1975.

Descriptors: *Forecasting, *Groundwater movement, *Reservoirs, *Surface-groundwater relationships, Subsurface waters, Surface waters,

Groundwater, Hydrologic equations, Analytical techniques, Analysis, Foreign research, Foreign countries, Base flow.
Identifiers: *USSR.

An approximate analytical solution of the water exchange based on the following assumptions was presented: (1) the area where the aquifer is drained by the reservoir is underlain by a horizontal impervious bed, and the height of the water level in the reservoir above the aquifer is the same over the entire water area; (2) the recharge of the groundwaters by infiltration and their discharge into the zone of aeration are negligibly small during the reference time interval; (3) the thickness of the aquifer at the upper boundary of the zone of depression of the groundwater surface, produced by the reservoir, and the depression radius are constant in time; and (4) the drop in the water level of the reservoir during the selected reference time interval is linear. Under the mentioned conditions, the unit groundwater discharge into the reservoir was expressed by the Dupuit equation. Application of this solution agreed satisfactorily with a field investigation. The use of the results of determination of water exchange by the proposed method in computations of the hydrologic budget of reservoirs should reduce the discrepancies in the budget and correspondingly increase the accuracy of its computation. (Humphreys-ISWS)
W77-10321

MASS BALANCE MONITORING OF LAND APPLICATION SITES FOR WASTEWATER RESIDUALS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10326

PROBLEMS OF HEAT STORAGE IN AQUIFERS,
Eidgenoessische Technische, Zurich (Switzerland). Institut fur Geophysik.
For primary bibliographic entry see Field 5B.
W77-10332

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5G.
W77-10355

THE USE OF NATURAL TRITIUM FOR EVALUATING AQUIFER RECHARGE,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 2F.
W77-10372

HYDRAULIC DESIGN DATA FOR WATER WELLS IN UNCONSOLIDATED SEDIMENTS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 8B.
W77-10377

EFFECTS OF SILTATION ON RATES OF RECHARGE,
Queensland Irrigation and Water Supply Commission, Brisbane (Australia).
S. E. James, and J. L. Henry.
Australian Water Resources Council Technical Paper No. 23, 1977. 32 p, 11 tab, 22 fig, 4 ref.

Descriptors: *Artificial recharge, *Infiltration rates, *Suspended solids, *Australia, Groundwater recharge, Induced infiltration, Silting, Sediments.
Identifiers: *Burdekin - Haughton Delta(Qld).

The eastern part of the Burdekin-Haughton Delta on the coast of Queensland, Australia, is serviced by an artificial groundwater recharge scheme involving the diversion of flow from the Burdekin River through a system of channels, trenches and pits. The major operating problem of the scheme is a reduction in infiltration rates, thought to be associated with clogging of sediments by material suspended in the recharge water. A description of the region, its climate, geology, hydrology, water useage and recharge works is provided, together with an account of a data collection study of the composition of the recharge water and associated effects on infiltration rates. (CSIRO)
W77-10378

ANALYSIS OF THE MOVEMENT OF WATER FROM RECHARGE CHANNELS AND PITS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
S. N. Webb, and K. K. Watson.
Australian Water Resources Council Technical Paper No 24, 1977. 174 p, 14 ref.

Descriptors: *Artificial recharge, *Pit recharge, *Infiltration, *Australia, Induced infiltration, Groundwater recharge, Numerical analysis, Computer models.
Identifiers: *Burdekin - Haughton Delta(Qld).

As part of a series of studies of the operation and problems of the artificial groundwater recharge scheme on the Burdekin-Haughton Delta of Queensland, Australia, an analysis was undertaken to elucidate the patterns of movement of water from the recharge channels and pits. The results are presented in two parts: numerical analyses, with theoretical background and outlines of the computer programs; and field studies, with details of data collection and analysis. The numerical analyses included two dimensional unsteady flow and steady state studies, and a one dimensional simulation of surface clogging due to suspended material in the recharge water. Field studies investigated diurnal recharge variations, and pressure, water content, and temperature profile development patterns, for one of the pits. (CSIRO)
W77-10379

CONSEQUENCES OF GROUNDWATER EXTRACTION ON EVAPOTRANSPIRATION AND SATURATED-UNSATURATED FLOW,
International Courses in Hydraulic and Sanitary Engineering, Delft (Netherlands).
P. J. M. de Last, C. van den Akker, and Th. J. van de Nes.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 67-76, 1975. 3 fig, 1 tab, 2 ref.

Descriptors: *Evapotranspiration, *Model studies, *Groundwater movement, *Water balance, Saturated flow, Unsaturated flow, Mathematical models, Equations, Analytical techniques, Soil water movement, Saturated soils, Analysis, Foreign research, Foreign countries.
Identifiers: *The Netherlands.

A three-dimensional mathematical model was developed to solve field-size composite groundwater soil moisture systems in relation to actual evapotranspiration. The model comprises three subsystems: saturated flow, and evapotranspiration. The solution for saturated flow is approached with the finite element method, and the evapotranspiration is calculated by Penman's formula, which has been adapted to cropped surfaces. The uniqueness of the model lies in the treatment of the unsaturated flow, which has been approached with a pseudo steady-state solution. The second approach was found to be sufficiently accurate and extremely efficient. It allows for the numerical solution of the system in such a way that time increments in the order of magnitude of days can be used. The application to a field-size problem shows that in certain areas during the growing season considerable reductions in the actual evapotranspiration occur as a result of groundwater withdrawal. Input parameters include type of crop, rainfall rates, and standard meteorological data. Output of the hydraulic head, pressure head in the effective root zone, potential and actual evapotranspiration, open water runoff, saturation deficits, etc., can be in the form of plots or may be produced as printouts. Problems concerning (sub)surface runoff and hysteresis phenomena in the unsaturated zone are still to be solved. (See also W77-10419) (Humphreys-ISWS)
W77-10422

MATHEMATICAL MODELLING OF THE RETURN WATERS RUNOFF,
Laboratory of Mathematical Modelling of Hydrological Processes, Sarnigni, Tashkent (USSR).
J. M. Denisov, F. E. Rubynova, and A. I. Sergeev.
In: Application of Mathematical Models in Hydrology and Water Resources Systems; Proceedings of the Bratislava Symposium, September 1975: International Association of Hydrological Sciences Publication No. 115, p 77-84, 1975. 2 fig, 1 tab, 4 ref.

Descriptors: *Irrigated land, *Return flow, *Model studies, *Mathematical models, Equations, Analytical techniques, Analysis, Runoff, Groundwater movement, Unsaturated flow, Discharge(Water), Water balance, Irrigation, Foreign research, Foreign countries.
Identifiers: *USSR.

A mathematical model of the return waters runoff from irrigated areas was constructed by means of simple differential equations. The model was designed to great majority of parameters are physical quantities (characteristics), easily determined experimentally; while for the remainder of the parameters, evaluations were given which may effectively be used for a first approximation. The model can be used for calculating the water regime of an irrigated area as well as for designing and reconstructing the collecting drainage net. Applications of the model to an irrigated area of 310,000 ha for an 11 year period showed that the irrigation regime stabilized by the tenth year of its implementation. (See also W77-10419) (Humphreys-ISWS)
W77-10423

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.
For primary bibliographic entry see Field 2F.
W77-10429

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-10458

GROUND WATER ACT OF 1955 (REGULATION OF UNDERGROUND WATERS THRU A PERMIT SYSTEM).
For primary bibliographic entry see Field 6E.
W77-10495

MAN-MADE GEOTHERMAL ENERGY SOURCE USES OIL-FIELD KNOW-HOW.
For primary bibliographic entry see Field 8A.
W77-10515

WELL MAINTENANCE AND REHABILITATION,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 8B.
W77-10516

GROUNDWATER MONITORING WELLS,
Stearns and Wheeler, Cazenovia, N. Y.
For primary bibliographic entry see Field 5B.
W77-10517

DISPOSAL OF SALT WATER DURING WELL CONSTRUCTION, PROBLEMS AND SOLUTIONS,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-10519

PROTECTING GROUND WATER FROM DOMESTIC WASTEWATER EFFLUENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-10520

NEW INSTRUMENT EXPANDS WATER WELL TECHNOLOGY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W77-10521

KANSAS TASK FORCE TO DEVELOP WATER USE PROGRAM TO RESOLVE SERIOUS PROBLEMS,
Johnson Drillers Journal, Vol 49, No. 3, p 7-12, May-June, 1977.

Descriptors: *Water law, *Groundwater, *Water conservation, Droughts, Water management(Applied), Water shortage, *Kansas, *Water utilization.

Governor Bennett of Kansas called on a 26-member task force headed by Lieut. Governor Shelby Smith to develop programs for water use in that state. The task force is expected to make recommendations for action by the 1978 and 1979 legislative sessions. Several communities in eastern Kansas are presently suffering from the effects of low water table conditions; long-range goals for the proposed legislation include the improvement of conservation and management of state water supply. Immediate concerns of the task force are identifying the options available to state and local government units for resolving water problems, and assessing the social, economic, and environmental impact of all alternatives. (Eberle-NWWA)
W77-10522

MAKING WATER SUPPLY NITRATE REMOVAL PRACTICABLE,
Garden City Park Water District, N.Y.
For primary bibliographic entry see Field 5F.
W77-10525

PUMPING TESTS PROVIDE USEFUL DATA, PART II,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8B.
W77-10530

CONSTRUCTION OF A LARGE DIAMETER WELL,
For primary bibliographic entry see Field 8B.
W77-10531

CURRENT TRENDS IN WATER RECLAMATION TECHNOLOGY,
Los Angeles County Sanitation Districts, Whittier, Calif.
For primary bibliographic entry see Field 5D.
W77-10649

A SIMPLE EFFECTIVE METHOD FOR THE COMPUTER SIMULATION OF GROUNDWATER STORAGE AND ITS APPLICATION IN THE DESIGN OF WATER RESOURCE SYSTEMS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-10660

MODELING OF UNCONFINED GROUNDWATER SYSTEMS,
Lehigh Univ., Bethlehem, Pa. Dept. of Civil Engineering; and Lehigh Univ., Bethlehem, Pa. Fritz Engineering Lab.
For primary bibliographic entry see Field 2F.
W77-10661

AN ECONOMIC ANALYSIS OF IRRIGATED FARMING WITH DIMINISHING GROUND WATER RESERVES,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
A. K. Sanghi, and R. Klepper.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 433, Price codes: A04 in paper copy, A01 in microfiche. Report NSF-RA-760084 (CBNS/AE/8), May 1976. 57 p, 8 tab, 30 ref. NSF AER-75-19031.

Descriptors: *Economic impact, *Crop production, *Groundwater availability, Economic feasibility, Net profit, Methodology, Analysis, *Irrigation, Irrigation efficiency, Corn(Field), Crop response, Soil-water-plant relationships, Water requirements, Water table aquifers, Zone of saturation, Plant growth, Great Plains.

A method is developed for evaluating the economic aspects of groundwater irrigation for individual farms, focusing on the effect of a declining water table on crop yield and its consequent effect on net return. The key aspect of the method is a production function which incorporates the availability of water in a critical period of plant growth and differentiates between the effect of a water deficit on yield in the critical period and other stages of plant growth. The method is demonstrated using hypothetical examples of corn crops under center pivot irrigation with declining water tables. Results show that net farm income is more vulnerable to fluctuations in crop yield as the well is reduced due to the declining water table than it is to higher pumping costs due to increased lift. The limiting factor for irrigated farming from groundwater is the saturated thickness of the aquifer as the saturated thickness declines. In addition, there is a need for a better understanding of the relationships between water applications and crop yield, since the resulting net returns for individual farmers are the major input for their investment decisions, and for determining broader issues of the optimal drilling rate for groundwater resources and the associated problem of commonality in groundwater use. (Luedtke-Wisconsin)
W77-10748

PUMP TESTING IN HETEROGENEOUS AQUIFERS,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2F.
W77-10764

STATISTICAL APPLICATIONS IN GROUNDWATER SYSTEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-10789

4C. Effects On Water Of Man's Non-Water Activities

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4A.
W77-10179

EFFECT OF LAND USE MANAGEMENT ON FLOOD PREDICTIONS,
Central Shenandoah Planning District Commission, Staunton, Va.
R. W. Smith, D. K. Jamison, and J. W. Knapp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 645, Price codes: A03 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg. Bulletin 103, June 1977. 39 p, 13 fig, 11 tab, 4 ref, append. OWRT A-062-VA(3).

Descriptors: *Flood forecasting, *Virginia, Methodology, Floods, Management, Cities, Evaluation, *Alternative planning, *Land use, Urbanization, Watersheds(Basins).
Identifiers: *South River watershed(Va), *Urban watersheds.

This study investigated the effects of changes in land-use practices and hydrologic parameters on flooding in an urbanizing area. It adapted modeling techniques developed by the Soil Conservation Service to local computing facilities and applied these models to flooding problems in the South River Watershed in and above Waynesboro, Virginia. (A related research project, (see W77-02078), developed methods to predict runoff from various soil conditions and land uses and, by use of a finite-element technique, to predict total downstream runoff.) This study provides comparative data and presents a methodology allowing evaluation of alternative courses of action needed to produce a least-cost flood-management program. In addition to developing computer analysis capability at the local level, the project produced findings that were instrumental in developing flood-management guidelines adopted by the South River Watershed Flood Control Commission and the Central Shenandoah Planning District Commission.
W77-10181

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
J. R. Reed, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 659, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 97, June 1977. 61 p, 17 tab, 11 fig. OWRT A-056-VA(1).

Descriptors: Road construction, Streamflow, Sediments, *Benthos, Fish, Biological communities, Computer programs, Aquatic drift, Littoral drift, *Erosion control, Sediment control, Water pollution effects, *Virginia.
Identifiers: *Road construction effects, Siltation, Species diversity, Non-point pollution sources.

This study investigated how aquatic macrobenthic and fish communities responded to the effects of

siltation from highway construction. Community response was evaluated on the basis of community diversity and changes in the numbers of organisms and/or species. An innovative computer program calculated the diversity indices, using the sequential comparison technique. The primary response observed among the macrobenthic and fish communities was a reduction both in numbers of species and in organisms downstream from the construction. The diversity index also demonstrated a statistically significant long-term change in aquatic community structure, but was less meaningful for indicating initial effects or making single comparisons. Findings suggest that drift is a major physical response of macrobenthos to increased siltation, and may be a primary mechanism for repopulating stressed habitats. This is contrary to the commonly held hypothesis that smothering is a major effect, and should be tested in further investigations. Fishes apparently vacated areas of increased siltation, but were able to repopulate such areas within 12 months after construction activity stopped, depending upon the stream's cleansing ability. In this connection, stream flow rate and gradient are significant factors. In general, this study found that erosion-control measures as they commonly are applied in highway construction are of limited value in preventing damages to stream communities, especially in the early construction stages. This indicates a need for more comprehensive and particularly more timely application of appropriate erosion-control techniques.
W77-10182

OPTIMAL SYSTEMS OF STORM WATER DETENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W77-10184

SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STREAM IN SOUTHERN ONTARIO,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10260

THE EFFECT OF FIRE ON THE CALIFORNIA CHAPARRAL VEGETATION,
Academia Sinica, Taipei (Taiwan). Inst. of Botany.
For primary bibliographic entry see Field 5C.
W77-10324

OFFSHORE MINERAL RESOURCE EXPLOITATION: THE STATE AND FEDERAL RESPONSE,
For primary bibliographic entry see Field 6E.
W77-10471

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
For primary bibliographic entry see Field 4A.
W77-10612

A HYDROMETEOROLOGICAL RESEARCH PROGRAM,
Illinois State Water Survey, Urbana. Atmospheric Sciences Section.
For primary bibliographic entry see Field 2B.
W77-10658

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5A.
W77-10758

4D. Watershed Protection

PROBLEMS AND POLICY ALTERNATIVES: CONSTRUCTION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-10164

EFFECT OF ANTECEDENT CONDITIONS ON FROZEN GROUND FLOODS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2C.
W77-10175

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
For primary bibliographic entry see Field 4C.
W77-10182

OPTIMAL SYSTEMS OF STORM WATER DETENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
D. K. Mynear, and C. T. Haan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 644, Price codes: A05 in paper copy, A01 in microfiche. Research Report No. 104, June 1977. 76 p, 11 fig, 4 tab, 35 ref. OWRT B-046-KY(2), 14-34-0001-6081.

Descriptors: *Detention reservoirs, Urban hydrology, *Storm water, Management, Cities, *Settling basins, Methodology, Computer programs, *Urbanization, Design, Watersheds(Basins), Optimization.
Identifiers: *Optimum (least cost) systems.

Flood retention basins are commonly used in urban areas to reduce the impact of urbanization on downstream flooding. When more than a few acres are developed, systems of retention basins are often required. A procedure has been developed whereby the optimum (least cost) system of basins can be determined to meet a given downstream flow requirement. The method considers several design options including basins on all sub-watersheds, basins on only some of the sub-watersheds, basins of various sizes and basins with various stage-discharge characteristics. The procedure has been developed in the form of a computer program to aid the designer in selecting the optimum system of stormwater retention basins. This report develops the methodology, presents the computer program and illustrates the use of the program. (Huffsey-Kentuckyk)
W77-10184

SIMULATION OF THE SEDIMENTOLOGY OF SEDIMENT DETENTION BASINS,
Kentucky Water Resources Research Inst.. Lexington.
For primary bibliographic entry see Field 5G.
W77-10185

SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STREAM IN SOUTHERN ONTARIO,
Guelph Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10260

REDUCTION OF 2, 4-D LOAD IN SURFACE RUNOFF DOWN A GRASSED WATERWAY,
Agricultural Research Service, Tifton, Ga. Southern Region.
For primary bibliographic entry see Field 5G.
W77-10323

A NEW CODE FOR REDUCING STREAM SILTATION,
Environment Protection Authority, Melbourne (Australia).
F. Balkau, and D. G. Thompson.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p 108-111. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Streams, *Sediment control, *Regulation, *Australia, State governments, Land development, Soil conservation, Construction, Sediment load, Administrative agencies.
Identifiers: *Victoria, Codes of Practice, Land disturbance.

A Land Disturbance Working Party comprising members of state government agencies in Victoria, Australia, has been convened to recommend remedies for the problem of high sediment loads in streams. Its approach has been to concentrate on compiling the necessary technical information for the production of a Code of Practice, initially for the use of government agencies involved in land disturbance activities, though it is hoped that the guidelines will also be adopted by private companies and consultants. The origins and effects of stream sedimentation, and the approach of the Working Party in compiling the guidelines, are briefly reviewed. (CSIRO)
W77-10369

THE APPLICATION OF A DETERMINISTIC MODEL TO A SEMIARID BASIN (APPLICATION DU MODELE A DISCRETISATION SPATIALE A UN BASSIN VERSANT SEMI-DESERTIQUE),
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2A.
W77-10424

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W77-10426

MATHEMATICAL SIMULATION MODELS OF HYDROLOGICAL PROCESSES IN TURKEY,
Aegean Univ., Bornova (Turkey). Faculty of Engineering Sciences.
For primary bibliographic entry see Field 2A.
W77-10430

A MODEL OF THE MELTING PROCESS OF THE SNOW COVER AS A PART OF CATCHMENT MODELS,
Meteorologischer Dienst der Deutschen Demokratischen Republik, Berlin. Forschungsinstitut fuer Hydrometeorologie.
For primary bibliographic entry see Field 2C.
W77-10432

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS,
For primary bibliographic entry see Field 6F.
W77-10451

STORM MANAGEMENT PROGRAM IS MODEL FOR OTHERS,
Georgia Inst. of Tech., Atlanta. Dept. of City Planning.
For primary bibliographic entry see Field 4A.
W77-10612

PREDICTION OF VELOCITY DISTRIBUTION IN A VORTEX TUBE SEDIMENT TRAP WITH TURBULENCE MODELS,
Nebraska Univ. Panhandle Station at Scottsbluff.
R. J. Edling, B. J. Barfield, and C. T. Haan.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 2, p 301-308, March-April 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Sediment control, *Sediments, *Vortices, *Model studies, Mathematical models, Velocity, Flow, Sediment transport, Fluid mechanics, Hydraulics, Open channels, Distribution patterns, Rotational flow, Turbulence.
Identifiers: *Vortex tube sediment traps, *Sediment traps, Turbulence models.

Meaningful investigation into the potential and limitations of the vortex tube sediment trap could be accomplished theoretically if prediction of velocity profiles were possible. Empirical and semi-empirical velocity prediction techniques were tested. In the empirical technique, constants combining values for mean flow velocity, wall velocity, and vortex perimeter velocity were applied; whereas in the semi-empirical technique, a two equation turbulence model containing equations for turbulence kinetic energy and dissipation was applied. Prediction models were tested experimentally. Results revealed a range in constants for the empirical technique which indicated that the method could only be used as a guide. The semi-empirical prediction values approximated measured velocity values. (Sims-ISWS)
W77-10657

GENETIC ANALYSIS OF THE SUSPENDED LOAD DISCHARGE OF MOUNTAIN RIVERS,
Tashkent Univ. (USSR).
For primary bibliographic entry see Field 2J.
W77-10778

WATERSHED SEDIMENT YIELD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
H. W. Shen, and R. M. Li.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 21, Colorado State University, Fort Collins, p 21-1 - 21-68, 1976. 19 fig, 2 tab, 50 ref.

Descriptors: *Watersheds(Basins), *Sediment yield, *Model studies, *Soil erosion, Theoretical analysis, Rainfall, Runoff, Stochastic processes, Mathematical models, Soil management, Erosion control, Analytical techniques, Numerical analysis, Statistical models, Equations, Hydrographs, Sediments, Regression analysis.

Much of the sediment transported by rivers and deposited in reservoirs is eroded from watersheds. Watershed sediment yield is a direct indication of the land erosion rate in watersheds. Soil loss by surface runoff from a watershed is due to any or a combination of the four following processes: (1) raindrop splash erosion; (2) sheet erosion by overland flow; (3) rill, gully and channel erosion; and (4) massive land sliding. The important governing factors are: (1) climate; (2) topography; (3) soil; and (4) vegetation or land management. The basic principles for determining watershed sediment yield by statistical regression models, unit sediment graph, parametric routing models and stochastic models are quite similar. Essentially they all contain the following steps: rainfall distribution, rainfall-runoff model, and runoff-sediment model. (See also W77-10439) (Humphreys-ISWS)
W77-10790

STOCHASTIC ASPECTS OF INCIPIENT GRAIN MOTION ON RIVERBEDS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10792

SEDIMENT TRANSPORT MODELS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineers.
For primary bibliographic entry see Field 2J.
W77-10793

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR, WATER, AND SOIL BY THERMAL ENERGY ANALYSIS: MEASUREMENTS IN BALTIMORE, MD.,
Thermo Electron Research Center, Waltham, Mass.
D. H. Fine, D. P. Rounbehler, A. Rounbehler, A. Silvergleid, and E. Sawicki.
Environmental Science and Technology, Vol 11, No 6, p 581-584, June 1977. 2 fig, 4 tab, 16 ref. EPA 68-02-2312.

Descriptors: *Analytical techniques, *Air pollution, *Pollution abatement, *Maryland, *Testing procedures, Air environment, Pollutants, Analysis, Soil analysis, Water analysis, Chemical analysis, Chromatography, Mass spectrometry, Chemistry, Instrumentation.
Identifiers: *Curtis Bay(Md), *Baltimore(Md), *Stonehouse Cove(Md), *Dimethylnitrosamine, *Thermal energy analysis, *Dimethylhydrazine, Nitrosamines, Mobile laboratory, Airborne carcinogens.

Dimethylnitrosamine (DMN) was reported to be present as an air pollutant in Baltimore, Maryland. On the site of a chemical factory that is manufacturing unsymmetrical dimethylhydrazine for which DMN is an intermediate, average DMN levels are 11,600 ng/cu m. Average DMN levels in neighboring residential communities are 1070 ng/cu m, with DMN levels in downtown Baltimore being between 30 and 100 ng/cu m. Salt water from the Curtis Bay and Stonehouse cove area surrounding the chemical factory contains DMN at the 35-940 ng/L level. (Henley-ISWS)
W77-10129

TRANSFER TO FISH OF PETROLEUM PARAFFINS AND ORGANIC SULFUR COMPOUNDS,
Okayama Univ. (Japan). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5C.
W77-10144

EFFECT OF SURFACTANTS ON THE DETERMINATION OF ALUMINUM IN WATERS,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
P. Pakalns, and Y. J. Farrar.
Water Research, Vol. 11, No. 4, p. 387-392, 1977. 1 fig., 1 tab., 5 ref.

Descriptors: *Analytical techniques, *Aluminum, *Surfactants, Spectrophotometry, Detergents, Detergents, Nitrilotriacetic acid, Linear alkylate sulphonates, *Pollutant identification.

The ways in which 11 surface-active substances--mostly detergents--affected the determination of aluminum in waters by spectrophotometric methods is described. Cationic, anionic and nonionic detergents at concentrations up to 2,100 and 1000 mg/l did not interfere with such determinations, but sodium tripolyplosphate interfered badly above 1.0 mg/l. Concentrations of NTA, soap and sodium pyrophospate had to be below 0.5, 10 and 20 mg/l, respectively, to limit the error to 5%. The severe tripolyphosphate interference could be overcome by hydrolysis of the tripolyphosphate to phosphate, but even then 10 mg/l washing powder gave a recovery of 93%. The ferron-orthophenanthroline method can be used only after a correction for iron is made. This method can tolerate large concentrations of all surfactants tested and is recommended for determination of aluminum in polluted waters provided there is no iron interference. The three methods investigated can determine aluminum satisfactorily in natural waters because detergent concentrations seldom exceed 0.5 mg/l, and unless raw effluent is present, tripolyphosphate will be degraded by 90% during activated sludge treatment. The atomic absorption spectrophotometric methods which uses 8-quinolinol extraction into chloroform and ethyl propionate can extract aluminum in the presence of washing powder but its sensitivity for aluminum is low. (Auen-Wisconsin).
W77-10151

MERCURY IN WATERWAYS THAT DRAIN INTO THE WASH, IN EASTERN ENGLAND,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5B.
W77-10152

THE DETERMINATION OF DISSOLVED INORGANIC CARBON, A POSSIBLE SOURCE OF ERROR IN DETERMINING THE PRIMARY PRODUCTION OF LAKE WATER PHYTOPLANKTON,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
For primary bibliographic entry see Field 5C.
W77-10153

AN INVESTIGATION OF THE PARTICULATE PHASE OF ACID PRECIPITATION,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 2B.
W77-10178

AN IDENTIFICATION KEY TO THE WATER MITE FAMILIES OF THE ETHIOPIAN REGION,
University of Durban-Westville (South Africa). Dept. of Zoology.
C. A. Jansen van Rensburg.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 11-20, 1976. 58 fig, 27 ref.

Descriptors: Morphology, Aquatic animals, *Africa, *Mites, Pollutant identification.
Identifiers: Arthropoda, Acari, *Ethiopia, South Africa.

A condensed reference is provided to the structure of and terminology used in the study of water mites, as well as a workable illustrated key for quick identification of families which are likely to be found in fresh waters on the African continent south of the Sahara. Definitions of the basic technical terms as applied to water mites are appended. (So. African Water Info. Center)
W77-10192

DIATOM INDICATOR GROUPS IN THE ASSESSMENT OF WATER QUALITY IN THE JUKSKEI-CROCODILE RIVER SYSTEM (TRANSVAAL, REPUBLIC OF SOUTH AFRICA),
National Inst. for Water Research, Pretoria (South Africa).
F. R. Schoeman.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. liver, Hennops River, Crocodile River, South Africa.

Descriptors: Ecological distribution, *Diatoms, Water quality, Evaluation, Algal growth, Eutrophication, Rivers, *Bioindicators, *Pollutant identification.
Identifiers: Jukskei River, Modderfontein River.

Based on the detailed study of Cholnoky on the ecology of diatoms, species with similar ecological requirements are arranged in groups. The use of these datom groups as reliable indicators of the water quality in the Jukskei-Crocodile river system (Transvaal) is examined. The predictions of the water quality based on the diatom groups are compared with the chemicaland algal growth potential data. The results indicate that the diatom groups employed can serve as reliable indicators of water quality. In the present study they further suggest that the Modderfontein and Jukskei rivers are considerably more eutrophied than the Hennops and Crocodile rivers. (So. African Water Info. Center)
W77-10193

CADMIUM CONCENTRATIONS IN THE TISSUES OF BULLIA DIGITALIS (PROSOBRANCHIATA) FROM THE SOUTH AFRICAN WEST COAST,
Cape Town Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10203

PHOTOSYNTHETIC BACTERIA IN RIETVLEI DAM,
National Inst. for Water Research, Pretoria (South Africa).
G. C. Coetzer, and D. F. Toerien.
South African Journal of Science, Vol. 72, No. 3, p 88, March 1976. 1 tab, 1 fig, 7 ref.

Descriptors: *Photosynthetic bacteria, Metabolism, Bacteria, Sampling, Eutrophication, Isotherms, Stratification, Aerobic conditions, Anaerobic bacteria, *Pollutant identification, Depth, Distribution.
Identifiers: *Rietvlei dam(South Africa), Rhodopseudomonas, Rhodomicrobium, Rhodospirillum.

An investigation of the occurrence of photosynthetic bacteria in Rietvlei dam near Pretoria, showed the presence of all three purple non-sulphur bacterial genera, i.e. Rhodopseudomonas, Rhodomicrobium and Rhodospirillum. No definite depth distribution of the bacteria was observed. Sampling techniques are described. (So African Water Info Center)
W77-10204

METALS IN ORGANISMS FROM SALDANHA BAY AND LANGEBAAN LAGOON PRIOR TO INDUSTRIALIZATION,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
For primary bibliographic entry see Field 5C.
W77-10205

OCCURRENCE AND POSSIBLE USE OF NON-SULPHUR PURPLE BACTERIA IN EFFLUENT TREATMENT PROCESSES,
National Inst. for Water Research, Pretoria (South Africa).
D. F. Toerien.
South African Journal of Science, Vol. 72, No. 5, p 148-149, May 1976. 4 tab, 3 ref.

Descriptors: *Sewage effluents, *Waste water treatment, *Anaerobic bacteria, Anaerobic digestion, Anaerobic treatment, Fatty acids, Activated sludge, *Methane bacteria, Methane production, *Photosynthetic bacteria, *Sewage treatment, Sewage bacteria, Management, *Pollutant identification.
Identifiers: Rhodospirillaceae, South Africa, Daspoort, Baviaanspoort.

To determine the presence of non-sulphur bacteria in different sewage treatment processes, a basal culture medium was variously supplemented with acetate, propionate, butyrate, valerate, citrate, benzoate, malate, methanol, ethanol and n-butanol. Photosynthetic bacteria were present at all sampling localities. The widespread distribution of these bacteria in sewage treatment plants and their ready growth on volatile fatty acids and alcohols suggest that it may be technically feasible to utilize such a system as part of sewage treatment processes or for the treatment of effluents rich in the lower fatty acids. (So African Water Info Center)
W77-10207

THE DESIGN OF A FULLY AUTOMATIC LIQUID INJECTION APPARATUS FOR USE ON A CARBON ANALYSER,
National Inst. for Water Research, Pretoria (South Africa).
R. A. Van Steenderen.
Water SA, Vol. 2, No. 3, p 125-130, July 1976. 3 fig, 3 tab, 5 ref.

Descriptors: *Pollutant identification, Design, Instrumentation, Liquids, Carbon, Analytical techniques, Equipment, Flow, Mode of operation, *Water analysis.
Identifiers: *Total organic carbon, *Carbon analysers.

A fully automatic liquid injection apparatus for use on a hitherto non-automated Beckman total organic carbon analyser Model IR915 is described. In the past the method of sample introduction into the carbon analyser has been a manual technique using a microsyringe. This was found tedious and time consuming for processing large numbers of samples on a routine basis. Technique is described that enables automatic sampling and analysis of twenty samples per hour. (So African Water Info Center)
W77-10209

APPARATUS FOR THE AUTOMATIC DETERMINATION OF OXYGEN CONSUMPTION IN FISH,
Port Elizabeth Univ. (South Africa). Dept. of Zoology.
J. F. Marais, A. F. Akers, and P. Van der Ryst.
Zoologica Africana, Vol. 11, No. 1, p 87-95, 1976. 5 ref, 2 fig.

Descriptors: Equipment, *Instrumentation, *Oxygen, Fish, *Respiration, Electrodes, Flow, Flow rates, *Bioassay, *Pollutant identification.
Identifiers: South Africa.

An apparatus is described which permits the automatic determination of the oxygen consumption of three fish and a control for 24 hours per day. This is made possible by an electrical control system operating four three-way valves which allow water from one of four respiration chambers at a time to flow past an oxygen electrode for quarter-hour periods. These values are registered successively on a recorder. (So African Water Info Center)
W77-10217

BROWN TROUT (SALMO TRUTTA L.) GROWTH AT REDUCED PH,
Oslo Univ. (Norway). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W77-10227

INDICATORS OF HEAVY-METAL CONTAMINATION IN THE LOOE ESTUARY (CORNWALL) WITH PARTICULAR REGARD TO SILVER AND LEAD,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, and L. G. Hummerstone.
Journal of the Marine Biological Association of the United Kingdom, Vol. 57, p 75-92, 1977. 4 tab, 4 fig, 26 ref.

Descriptors: *Lead, *Heavy metals, *Absorption, *Bioindicators, *Estuaries, *Algae, *Gastropods, *Mussels, *Mollusks, *Metals, *Copper, *Food chains, Cadmium, Iron, Cobalt, Manganese, Nickel, Zinc, Path of Pollutants, Invertebrates, Foodwebs, Sediments, Herbivores.
Identifiers: *Looe estuary(Cornwall), *Silver.

The two branches of the Looe Estuary in Cornwall receive metal contamination; one branch receiving lead and silver from old mines and the other receiving silver from a presumed industrial source. Analyses of these and eight other metals were made in seaweed (Fucus) as an indicator of levels the in water, in herbivorous gastropods (winkle, Littorina littorea; limpet, Patella vulgata), in filter feeders (mussel, Mytilus edulis; cockle, Cerastoderma edule) as indicators of contamination in suspended particles and in deposit feeders (bivalve molluscs Scrobicularia plana and Macoma balthica; Ragworm Nereis diversicolor) as indicators of available metals in sediments. Although the concentrations of particulate silver from the two sources were of the same order of magnitude, the influence of the non-mining source was much greater, a concentration of silver 425 times normal being observed in Scrobicularia at an upstream station. There was little evidence of contamination with dissolved silver in the estuary. Unlike silver, contamination with lead was consistent in the different species. Of the other metals (Cd, Co, Cr, Cu, Fe, Mn, Ni, Zn) copper was present at the most abnormal levels. (Katz)
W77-10228

A STUDY OF THE EFFECTS OF COPPER APPLIED CONTINUOUSLY AND DISCONTINUOUSLY TO SPECIMENS OF MYTILUS EDULIS (L.) EXPOSED TO STEADY AND FLUCTUATING SALINITY LEVELS,
Natural Environment Research Council, Bangor (Wales). Unit of Marine Invertebrate Biology.
For primary bibliographic entry see Field 5C.
W77-10239

FISHERY WASTE EFFLUENTS: A SUGGESTED SYSTEM FOR DETERMINING AND CALCULATING POLLUTANT PARAMETERS,
National Marine Fisheries Service, Kodiak, Alaska. Northwest and Alaska Fisheries Center.
J. Collins, and R. D. Tenney.
Fishery Bulletin, Vol. 75, No. 2, p 253-260, 1977. 3 fig, 4 tab, 6 ref.

Descriptors: *Industrial waste, *Analytical techniques, *Shrimp, *Chemical oxygen demand, *Water quality, *Monitoring, *Statistical methods, *Pollutant identification, Indicators, Commercial shellfish, Water pollution sources.
Identifiers: *Fishery waste.

An improved and simplified system to test for pollutants in shrimp waste effluents is presented. In addition, two methods were developed to calculate both protein and oil and grease content. The first method is based on establishing empirical regressions of protein or oil and grease on total residue. The second and preferred method, a simultaneous equation, is independent of these correlations but dependent on the total residue and chemical oxygen demand (COD) of the waste effluent obtained through routine analyses. The COD value was found to depend upon the amount of potassium dichromate remaining at the completion of the 2-h reflux period. The dichromate can vary from 0 to 6.25 meq excess and between 2 and 5 meq, the COD will vary 4.2%. A table of factors is given to correct the COD to 3.5 meq excess. Coefficients of COD were determined on a number of preparations of protein and oil and grease from shrimp waste effluent and from fish and shellfish. These coefficients (1.338 mg COD/mg protein and 2.678 COD/mg oil and grease) were required for the simultaneous equation. The simple analytical tests and mathematical treatment used in this system would be less expensive to the industry and would result in a more accurate and comprehensive evaluation of the waste load than currently ob-

tainable by methods specified in the monitoring regulations. (Katz)
W77-10242

EFFECTS OF POLLUTING SUBSTANCES ON ENZYMES OF AQUATIC ORGANISMS,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5C.
W77-10247

FATTY ACIDS AS ICHTHYOTOXIC CONSTITUENTS OF A GREEN ALGA CHEATOMORPHA MINIMA,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W77-10248

MERCURY IN AQUATIC ORGANISMS. II. MERCURY DISTRIBUTION IN MUSCLES OF TUNAS AND SWORDFISH, (IN JAPANESE),
S. Arima, and S. Umemoto.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 42, No 8, p 931-937, 1976. 2 tab, 4 fig, 24 ref.

Descriptors: *Mercury, *Fish physiology, Path of pollutants, *Absorption, *Proteins, Distribution, Public health, Commercial fish, Metals, *Marine fish, Biochemistry, Pollutant identification.
Identifiers: *Tissue analysis, *Tuna, *Thunnus, *Swordfish, *Muscle proteins.

Mercury distribution in fish muscle was determined using samples of ordinary muscle from the bigeye tuna, Thunnus obesus, bluefin tuna, T. thynnus, and swordfish, Xiphias gladius. Four components; myofibrillar protein (Mf), sarcoplasmic protein (Sp), extractives (nonprotein nitrogenous compounds) (Ex), and insoluble muscle residue (R) were separated from the muscle and mercury concentration in each was determined. The total mercury concentrations in the muscles ranged from 0.74 to 2.34 ppm. The mercury contents (Hg/N) were different among the four components being highest in Mf followed by Sp and R, and lowest in Ex. This resulted in an uneven distribution of mercury in muscle. The Mf and Sp fractions compose the major part of muscle protein and contained 71 to 89% of the muscle mercury. Similar patterns of mercury distribution were observed in the six muscles examined. Linear relations were found between the mercury content in muscle and that in Mf or Sp. At a low mercury level, mercury was preferentially incorporated into Mf, while at a higher level, mercury was incorporated into both Mf and Sp. (Katz)
W77-10253

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-IX, ISOLATION AND IDENTIFICATION OF PENTACHLOROPHENYL-B-GLUCORONIDE ACCUMULATED IN BILE OF GOLDFISH,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5C.
W77-10255

HEAVY METALS IN THE GASTROPOD MOLLUSC HALIOTIS TUBERCULATA (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W77-10256

CRITICAL THERMAL MAXIMA OF TWO SPECIES OF ESTUARINE FISH,
Environmental Research Lab., Narragansett, R.I.
For primary bibliographic entry see Field 5C.
W77-10258

COPPER TOXICITY EXPERIMENTS IN RELATION TO ABALONE DEATHS OBSERVED IN A POWER PLANT'S COOLING WATERS,
California State Dept. of Fish and Game, Monterey. Marine Bioassay Lab.
For primary bibliographic entry see Field 5C.
W77-10261

INFLUENCE OF SOIL PH ON THE AVAILABILITY OF ADDED BORON,
Wisconsin Univ., Madison. Dept. of Soil Science; and Wisconsin Univ., Madison. Dept. of Horticulture.
For primary bibliographic entry see Field 2G.
W77-10274

EXCHANGE AND HYDRATION PROPERTIES OF CU(2+) ON MIXED-ION NA(+) - CU(2+) SMECTITES,
Cornell Univ. Agricultural Experiment Station, Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W77-10276

POTASSIUM RELEASE FROM SAND, SILT, AND CLAY SOIL SEPARATES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W77-10277

TRIPOLYPHOSPHATE AND PYROPHOSPHATE HYDROLYSIS IN SEDIMENTS,
Monsanto Philippines Inc., Makati.
For primary bibliographic entry see Field 5B.
W77-10285

SOIL AERATION,
Edinburgh Univ. (Scotland). School of Agriculture.
For primary bibliographic entry see Field 2G.
W77-10325

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR AND WATER BY THERMAL ENERGY ANALYSIS: VALIDATION OF ANALYTICAL PROCEDURES,
Thermo Electron Research Center, Waltham, Mass.
D. H. Fine, D. P. Rounbehler, E. Sawicki, and K. Krost.
Environmental Science and Technology, Vol. 11, No. 6, p 577-580, June 1977. 3 fig, 3 tab, 13 ref.

Descriptors: *Pollutant identification, Analytical techniques, *Air pollution, *Water pollution, *Water analysis, Pollutants, Chemical analysis, Chromatography, Mass spectrometry, Chemistry, Instrumentation, Testing, Testing procedures, Analysis, Thermal power.
Identifiers: *Dimethylnitrosamine, *Validation of procedure, Airborne carcinogens, Nitrosamines, Cryogenic trapping, Air monitoring.

Analytical techniques for the analysis of dimethylnitrosamine (DMN), sensitive at the 1 ng/cu m level in air and at the 2 ng/L level in water, were described. For air analyses, DMN was scrubbed by one of three parallel procedures, cryogenic trapping, trapping in dilute alkali, or trapping on Tenax GC material. To ensure that the analytical procedures were valid and that there was no possibility of a positive or negative interference during scrubbing or subsequent work-up and chromatography, extensive control experiments were carried out on the site of two chemical factories. (Henley-ISWS)
W77-10329

USE OF A MODIFIED TENAX GC COLUMN PACKING FOR THE DIRECT GAS CHROMATOGRAPHIC ANALYSIS OF PHENOLS IN WATER AT THE PPM LEVEL,
Leeds Univ. (England). Dept. of Physical Chemistry.
K. D. Bartle, J. Elstub, M. Novotny, and R. J. Robinson.
Journal of Chromatography, Vol. 135, No. 2, p 351-358, May 21, 1977. 5 fig, 3 tab.

Descriptors: *Gas chromatography, *Analytical techniques, *Phenols, *Adsorption, Industrial wastes, Effluents, Organic compounds, Sewage treatment, *Waste water treatment, Waste treatment, *Pollutant identification.
Identifiers: Column packing, Tenax.

The use of gas chromatography with a Tenax (2,6-diphenyl-p-phenyl oxide polymer) column packing is examined as an effective means for the analysis of very dilute solutions (ppm levels) of phenols in water. Comparisons were made of the adsorption effects of three column packings: Tenax GC as received, and Tenas modified by the treatment with 2% and also 5% of its weight in polymetaphenyl ether. This modifying phase was chosen for its high temperature stability and similarity in molecular strucutre to that of Tenax in an attempt to deactivate the adsorption sites of Tenax, whose strong irreversible adsorption of polar compounds had been previously demonstrated and was reconfirmed in the experiment. A clear improvement in peak symmetry and in areas of the peaks was shown with the use of the modified Tenax. The improvement was greatest with the use of the concentrated solution of ether (5% of the weight of the Tenax) where early symmetrical peaks and and an efficient signal to noise ratio were observed. Retention times were shorter in the Tenax modified with 2% of its weight in ether than with the unmodified material but were increased in length by the use of the 5% modified Tenax, evidently showing a mixture of gas/liquid and liquid/gas chromatographic properties. Both quantitative and qualitative analyses were then made of aqueous solutions of phenols including the direct analysis of industrial effleunt samples. This column packing material was shown to provide for an efficient transmission and resolution of very small (ppm levels) quantities of organic compounds in the presence of tremendous excesses of water, thus meeting the requirement for a rapid method for the identification of individual phenols in industrial effluent. (Pfeifer-FIRL)
W77-10350

RAPID ANALYSIS OF ACID MINE DRAINAGE,
West Virginia Univ., Morgantown. Coal Research Bureau.
B. G. McMillan, D. J. Akers, and J. F. Colabrese.
Mining Congress Journal, Vol. 63, No. 5, p 28-33, May, 1977. 4 fig, 3 tab, 1 ref.

Descriptors: *Pollutant identification, *Mine drainage, *Acid streams, *Analytical techniques, *Colorimetry, *Mine acids, Mine water, Mining, Strip mine wastes, Acid mine water, Water pollution sources, Waste water treatment, Industrial wastes, Coal mines, Metals, Iron, Aluminum, Copper, Manganese, Nickel, Sulfates.

In light of increasing need for frequent monitoring and rapid treatment of industrial discharges and acid mine drainage, the feasibility of 'on-site' chemical analyses was evaluated. Results obtained by analyses for Al, Cu, Mn, Fe, Ni, and SO4 in acid mine drainage (AMD) using three analytical instruments (a portable field colorimeter, a laboratory model spectrophotometer, and an atomic absorption spectrophotometer) were compared for test accuracy and speed. It was found that ionic interference and pH may affect test accuracy. High iron concentrations must be eliminated by acidifying the AMD before concentrations of Al, Cu, Mn, Ni and SO4 can be determined. Using the percent mean error as a criterion for accuracy, use of the

spectrophotometer was preferred. Ni could be analyzed using either spectrophotometry or atomic absorption. (Schulz-FIRL)
W77-10356

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10362

A SYSTEM OF RADIATION MONITORING, AND METHODS AND EQUIPMENT FOR MEASURING WATER OF LOW SPECIFIC ACTIVITY,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. Institut Atomnoi Energii.
For primary bibliographic entry see Field 5B.
W77-10414

GROUNDWATER MONITORING WELLS,
Stearns and Wheeler, Cazenovia, N. Y.
For primary bibliographic entry see Field 5B.
W77-10517

A RAPID METHOD FOR THE QUANTITATIVE ISOLATION OF VIRUSES FROM POLLUTED WATER,
Hadassah Medical School, Jerusalem (Israel).
E. Katzenelson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 117, Price codes: A02 in paper copy, A01 in microfiche. 1976. 16 p, 2 fig, 4 tab, 14 ref.

Descriptors: *Viruses, *Pollutant identification, Cultures, Analytical techniques, Water pollution control, Chemical reactions, Chemical analysis, Bioindicators, Pollutants, Bioassay, Waste water treatment.

A method was presented for the rapid identification and quantification of viruses in polluted water. The fluorescent antibody technique was employed to determine viruses in tissue cultures within hours of infection. Positive cells were seen after 6-8 hours, but results were not sufficiently quantitative. An interval of 18-24 hours would be adequate for most applications. Possible 'false positive' results were considered in high-speed determinations because of reagent impurities. The method was less susceptible to bacterial contamination than those currently used. Reliability should be improved by the use of reagents with higher quality. Potable water determinations, by this method, were considered. (Collins-FIRL)
W77-10538

HANDBOOK FOR SAMPLING AND SAMPLE PRESERVATION OF WATER AND WASTEWATER,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
K. R. Huibregtse, and J. H. Moser.
1976. 276 p, 79 fig, 47 tab, 161 ref. EPA Technical Report EPA-600/4-76-049.

Descriptors: *Water analysis, *Sampling, *Analytical techniques, Chemical analysis, Testing procedures, Measurement, Monitoring, Instrumentation, Industrial water, Municipal water, Agricultural runoff, Biological properties, Chemical properties, Laboratory tests, On-site tests, Analysis, Waste water treatment.
Identifiers: Sample preservation.

Sampling techniques and methods of sample protection were provided for water and waste water analysis. The information was collected from literature and a survey of field practices. General sampling and other guidelines were presented. There was a discussion of automatic samplers, flow measuring devices, and a statistical approach to sampling. The preservation of physical, chemical, biological, and radiological parameters was also considered. Sampling procedures for waters from municipal, industrial, and agricultural sources were reviewed. Information was presented concerning surface water and sludge sampling procedures. The report was not an official EPA manual. (Collins-FIRL)
W77-10539

THE PERSISTENCE OF POLIOVIRUS IN ACTIVATED SLUDGE TREATMENT,
Surrey Univ., Guildford (England).
For primary bibliographic entry see Field 5D.
W77-10583

DISTRIBUTION OF GAS FORMING BACTERIA IN SULFUR DEPOSITS OF THE PRECARPATHIANS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
For primary bibliographic entry see Field 5B.
W77-10640

RECOVERY AND SUSCEPTIBILITY PATTERN OF FAECAL STREPTOCOCCI BACTERIOPHAGES,
National Research Centre, Cairo (Egypt). Water Pollution Dept.
F. A. Saleh.
Water Research, Vol. 11, No. 4, p 403-409, 1977. 1 fig, 5 tab, 24 ref.

Descriptors: *Streptococcus, *Pollutant identification, Sewage bacteria, Biological properties, Chemical properties, Analytical techniques, Separation techniques, Laboratory tests, Cultures, Water water treatment.

The incidence of fecal streptococci and their phages in fresh sewage samples was determined. About 120 isolated strains were recovered. Nearly 18% were classified as Str. faecalis, Str. faecalis var. zymogenes, Str. facecalis var. liquefaciens, Str. durans, Str. faecium, and Str. equinus. Another 52% were designated as atypical faecalis, I, II, III, and IV. Thirty percent were unidentified. Phage sensitive cultures were 68% of the isolates, phage resistant strains 32%. For phage recovery, two primary enrichment media containing MgSO4 and L-tryptophan were used. Of 20 samples, 19 yielded at least one phage type for recovery rate of 95%. Nine phages could not be isolated in the absence of MgSO4 and L-tryptophan co-factors; three of these required L-tryptophan and one required MgSO4. Phage typing was favorable, simple, and definitive for identification of a majority of the isolated cultures. Phage sensitivity was found to correlate with characteristics such as tellurite resistance, TTC-reduction, and mannitol fermentation. Further study of phage typing was recommended. (Collins-FIRL)
W77-10641

SCREENING METHOD FOR DETERMINATION OF THE DEGRADABILITY OF ORGANIC COMPLEXING AGENTS (SCREENINGVERFAHREN ZUR FESTSTELLUNG DER ABBAUBARKEIT ORGANISCHER KOMPLEXBILDNER),
K. H. Robra.
Zeitschrift fuer Wasser- und Abwasser-Forschung, Vol. 10, No. 3, p 104-108, 1977. 3 fig, 3 tab, 22 ref.

Descriptors: *Biodegradation, *Organic compounds, Carbon, Analytical techniques, Microorganisms, Biochemical oxygen demand, Biological treatment, Analysis, Performance, Waste water treatment.
Identifiers: Closed bottle test(GF-test).

Experiments were conducted to study the degree and rate of biological degradation of organic complex-forming compounds. The trials were based on the closed-bottle test (GF-Test). The only source of carbon for the microorganisms in the inoculum was the organic substances supplied. Degradation rates were expressed as a percentage of BOD relative to the decrease of organic substances in terms of the theoretical BOD. (Collins-FIRL)
W77-10644

WATER ANALYSIS,
Geological Survey, Denver, Colo.
M. J. Fishman, and D. E. Erdmann.
Analytical Chemistry, Vol. 49, No. 5, p 139R-158R, April, 1977. 429 ref.

Descriptors: *Analytical techniques, *Pollutant identification, *Monitoring, *Measurement, Organic compounds, Inorganic compounds, Gases, Metals, Water quality, Waste water treatment.

A two-year review (October 1974 through September 1976) was presented on the application of analytical chemistry to water analysis. Continuous monitoring, automated analysis, and sampling procedures were discussed. Analyses involved included major and trace inorganics, organics, and water characteristics. Several spectrometric methods were described for determinations of alkali metals and alkaline earth metals. Techniques for analysis of copper, zinc, lead, and similar metals included several methods of simultaneous analysis. A spectrophotometric method presented for phosphate analysis in waste water involved ultrafiltration, humic acid precipitation, and its determination as the yellow vanadate-molybdate complex. Arsenic determinations by flameless atomic adsorption spectrometry and sulfate analysis by gravimetric and automated spectrophotometric methylthymol blue methods were successful. Simultaneous determinations of ammonium, sodium, and potassium ions in waste water were achieved by using ion-selective electrodes. Methods applied to oxygen, ozone, and chlorine analysis included spectrophotometric, chemiluminescence, and colorimetric procedures. Organic pollutants were measured by gas chromatography-mass spectrometry. Automated and portable techniques were presented for analysis and monitoring. Other methods for organic determinations included membrane techniques, solvent extraction, and fluorometric techniques. Methods of radiochemical and isotopic analysis were presented. (Collins-FIRL)
W77-10648

SAMPLE PRETREATMENT FOR DETERMINATION OF SOME ANIONS IN HIGHLY POLLUTED EFFLUENTS (UPRAVA VZORKU PRED STANOVENIM NEKTERYCH ANIONTU V SILNE ZNECISTENYCH ODPADNICH VODACH),
Technical Univ. of Brno (Czechoslovakia).
F. Kosina, J. Kupec, M. Mladek, and A. Fojtu.
Chemicky Prumysl, Vol 26, No 11, p 601-603, November, 1976. 1 fig, 5 ref, 1 tab.

Descriptors: *Waste identification, *Water analysis, *Anions, *Cation exchange, Ion exchange, Effluents, Organic compounds, Sulfides, Tannery wastes, Water pollution sources, Wastes, Industrial wastes, Chlorides, *Pollutant identification, Sulfur compounds.

The determination of some anions such as chlorides in highly contaminated effluents is often hindered by the presence of organic materials. Instead of clarification with aluminum hydroxide, a method was developed and successfully tested, using highly acidic cation-exchange resin (Wofatit KBS) for the removal of undesirable dissolved organics. The use of a Samuelson column with a stirrer is recommended to avoid plugging. Some anions (such as sulfide, mercaptide, and thiosulfate) which interfere with the analysis can

be oxidized with 30% hydrogen peroxide solution. The described sample pretreatment using the cation-exchange resin and oxidation with peroxide was successfully applied to tannery wastes prior to the volumetric determination of chlorides. (Trubacek-IPC)
W77-10692

ANALYSIS OF POLLUTANTS IN EFFLUENTS OF A PYROLYSIS FACTORY (ANALIZ ZAGRYAZNENII STOCHNYKH VOD PIROLIZNOGO PREDPIYATIYA),
G. A. Smirnova, A. I. Firsov, and Yu. V. Vodzinskii.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No 8, p 15, 1976. 5 ref, 1 tab.

Descriptors: *Effluents, *Waste identification, *Waste water treatment, Pollution abatement, Wastes, Water pollution sources, Industrial wastes, Pollutants, Acids, Phenols, Carbohydrates, Anions, Cations, Inorganic compounds, Organic compounds, Biological treatment, Water pollution treatment, Oxidation, Aeration, Waste treatment, Effluents, Oxygen, Foreign countries, Treatment facilities.
Identifiers: *Wood pyrolysis, Wood products industry, Soviet Union(USSR).

In connection with stricter standards for the purification of waste waters in the USSR, analyses were made of effluents of the Syava wood pyrolysis plant. The untreated effluent contained, per liter, 1900 mg of 1-5 carbon acids, 120 mg of 6-20 carbon acids, 40 mg of phenols, 80 mg of carbohydrates, 42 mg of cations, and 4308 mg of anions, for a total of 2580 mg organic and 4350 mg inorganic substances. Biological purification reduced this load by 80-90%. The purified effluent had the same qualitative composition as before purification but contained only 110 mg/liter organic substances and 870 mg/liter inorganic substances. The treated effluent was found to be contaminated with higher acids, phenols, alcohols, aldehydes, and salts of organic and inorganic acids. It is suggested that the purification of the plant's effluents could be increased up to 99.7% by prolonging the oxidation time and increasing the amount of oxygen fed into the tanks, and also by conducting the biological purification in two stages, i.e., oxidation in ponds after the aeration tanks. (Stapinski-IPC)
W77-10698

ORGANIC COMPOUNDS IN RED PINE KRAFT BLEACHING SPENT LIQUOR (IN JAPANESE),
Government Forest Experiment Station, Tokyo (Japan).
K. Shimada.
Japan Tappi, Vol 31, No 2, p 97-103, February, 1977. 7 fig, 19 ref, 5 tab.

Descriptors: *Bleaching wastes, *Organic compounds, *Waste identification, *Pollutant identification, Wastes, Industrial wastes, Pulp wastes, Water pollution sources, Pine trees, Lignins, Chromatography, Gas chromatography, Mass spectrometry, Chemical analysis, Water analysis, Separation techniques.
Identifiers: Pinus densiflora(Japanese red pine), Kraft pulp, Kraft mills.

High- and low-molecular weight organic compounds were isolated from bleach plant effluents of kraft-pulped Pinus densiflora and examined for chemical characteristics. Among the high-molecular weight compounds, chlorinated oxylignin (COL) amounted to about 16% of total organic materials. Gel permeation and ultrafiltration indicated COL to have higher molecular properties than milled wood lignin or thiolignin (kraft lignin), but its chemical structure was seriously degraded during bleaching to the extent that the p-hydroxyphenylpropane unit predominant in the original lignin almost disappeared. However, a small amount of chlorinated aromatic rings was still present in the COL molecule, as evidenced by chlorinated vanillin derivatives among the alkaline cupric oxide oxidation products. Low-molecular weight compounds obtained by continuous extraction with n-hexane, ethyl ether, and ethyl acetate, isolated by column chromatography and identified by gas chromatography/mass spectrometry and chemical analyses, included palmitic acid, stearic acid, 2,4,6-trichlorophenol, 5-chlorovanillin, beta-sitosterol, p-hydroxbenzoic acid, vanillic acid, 5- and 6-chlorovanillic acids, syringic acid, and ferulic acid. (Brown-IPC)
W77-10699

ON THE PROPERTIES OF WASTE WATER PRODUCED IN OZONE BLEACHING OF KRAFT PULP (IN JAPANESE),
Government Industrial Research Inst., Takamatsu (Japan).
T. Kubo, J. Hosokawa, T. Kobayashi, and Y. Kimura.
Japan Tappi, Vol. 31, No. 2, p 104-109, February, 1977. 8 fig, 12 ref, 4 tab.

Descriptors: *Bleaching wastes, *Ozone, Wastes, Industrial wastes, Pulp wastes, Carbohydrates, Acids, Lignins, Organic compounds, Effluents, Pulp and paper industry, Effluents, *Waste identification, *Pollutant identification.
Identifiers: Kraft pulp, Kraft mills.

Effluents from the ozone stage of kraft pulp bleach plants were compared with those of CEHDED bleaching. In the ozone effluent, carbohydrate and weak acid contents increased with bleaching levels, while lignin content first increased (during the initiation period) and then decreased. Gel filtration chromatograms, infrared, and nuclear magnetic resonance spectra indicated decomposition of macromolecular lignin to lower-molecular weight organic compounds with no absorption at 280 nm. Carbohydrate and TOC components in the ozone effluent (compared at 85% pulp brightness) were higher than in the chlorination effluent, despite the former's lower lignin content, owing to a greater amount of low-molecular weight organic compounds. (Brown-IPC)
W77-10700

DETERMINATION OF CONTAMINANTS IN KRAFT MILL CONDENSATES USING GAS CHROMATOGRAPHY (STANOVENI KONTAMINUJICICH LATEK V KONDENZATECH ZE SULFATOVE CELULOZKY POMOCI PLYNOVE CHROMATOGRAFIE),
IRAPA, Pfague (Czechoslovakia). Vyvojovy a Racionalizacni.
L. Ruzickova.
Papir a Celuloza, Vol. 31, No. 12, p 277-278, 1976. 1 fig, 3 ref, 1 tab.

Descriptors: *Waste identification, *Gas chromatography, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Hydrogen ion concentration, Water analysis, Analytical techniques, Chromatography, Evaporators, Sulfides, Alcohols, Organic compounds.
Identifiers: *Kraft mills, Methyl mercaptan, Dimethyl sulfide, Dimethyl disulfide, Methanol, Ethanol, Acetone.

The gas-chromatographic analysis of kraft mill condensates was carried out using a 2-m-long stainless steel column with Chromosorb AW-HMCS wetted with 20% Triton X-305. The column was heated to 100 C, and the flow of nitrogen, hydrogen, and air was kept at 40, 50, and 750 ml/min, respectively. The chromatograph had a flame ionization detector. A total of seven samples were analyzed, obtained from digester relief and multiple-effect evaporators in various kraft mills. Tabulated results show the pH and the concentrations of methyl mercaptan, dimethyl sulfide and disulfide, methyl and ethyl alcohols, and acetone in the samples. Also shown are examples of chromatograms obtained. (Trubacek-IPC)
W77-10712

DAPHNIA PULEX PULLS ITS WEIGHT IN PULP MILL TOXICITY TESTS,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
E. W. Tunstall, and M. Solinas.
Pulp and Paper Canada, Vol. 78, No. 4, p 84-85, 87-90 (T93-T98), April, 1977. 3 fig, 1 illus, 14 ref, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, *Bioassay, *Daphnia, Wastes, Industrial wastes, Effluents, Aquatic animals, Costs, Operating costs, Crustaceans, Insects, Fish, Water pollution sources, Testing, Testing procedures, Biological treatment, Pulp and paper industry, Aquatic microorganisms, *Pollutant identification.

A method for testing the toxicity of pulp mill effluents to an aquatic microorganism, Daphnia pulex, has been developed. The bioassay gave reproducible and self-consistent results which showed good correlation with those of a fish bioassay. The simplicity of rearing daphnids and using them for testing toxicity makes the test suitable for use at the mill site. The small effluent volumes required for administering the test make it ideal for research. Cost of the 24-hr test is a fraction of the 96-hr fish bioassay. (Brown-IPC)
W77-10718

A LONG-RANGE PROGRAM FOR MEETING THE PAPER INDUSTRY'S ENVIRONMENTAL PROTECTION TECHNICAL INFORMATION NEEDS,
National Council of the Paper Inustry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-10720

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 2. DIFFERENT SEQUENCES FROM PREBLEACHING OF PINE AND BIRCH KRAFT PULP,
Swedish Forest Products Research Lab. Stockholm.
H. L. Hardell, and F. de. Sousa.
Svensk Papperstidning, Vol. 80, No. 7, p 201-209, April 25, 1977. 6 fig, 8 ref, 12 tab.

Descriptors: *Bleaching wastes, *Waste identification, *Water analysis, Chlorine, Organic compounds, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Waste water(Pollution), Water pollution, Pine trees, Effluents, Pulp wastes, Color, Hardwood, Softwood.
Identifiers: Chlorine dioxide, Chlorine compounds, Kraft pulp, Birch trees(Betula).

The previously outlined method of characterizing bleach plant effluents has been used to compare different prebleaching sequences for soft- and hardwood kraft pulps based on C1, chlorine dioxide, and their mixtures. When chlorine dioxide was used, relatively more organic material was dissolved in the first stage, probably because of the greater oxidizing power of chlorine dioxide than of C1. For the same reason probably, the proportion of high-molecular weight organic materials in the spent liquor increased with increasing amounts of chlorine dioxide used in bleaching. The color of pine pulp bleaching effluent, using chlorine dioxide alone, was about one-half that of the spent C1 bleach liquor. For birch kraft pulp, the corresponding color reduction was only about 20%. (See also W77-09731) (Brown-IPC)
W77-10723

A PRESENTATION OF THE NORWEGIAN EFFECT 'ACID PRECIPITATION-EFFECTS ON FOREST AND FISH',
Royal Norwegian for Scientific and Industrial Research, Kjeller.
For primary bibliographic entry see Field 5C.
W77-10724

USE OF LABORATORY EXTRACTION DATA TO PREDICT LOSSES OF DISSOLVED INORGANIC PHOSPHATE IN SURFACE RUNOFF AND TILE DRAINAGE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
A. N. Sharpley, R. W. Tillman, and J. K. Syers.
Journal of Environmental Quality, Vol 6, No 1, p 33-36, 1977. 4 fig, 2 tab, 14 ref.

Descriptors: *Phosphorus, Surface runoff, *Subsurface runoff, *Measurement, *Laboratory tests, Analytical techniques, Pastures, Tile drainage, Fertilization, Foreign research, *Pollutant identification, *Phosphates, *Dissolved solids.
Identifiers: New Zealand, Non-point phosphorus sources.

A laboratory procedure is described which measures extractable soil inorganic phosphorus to predict losses of dissolved inorganic phosphorus (DIP) in surface runoff and subsurface tile drainage from a soil under permanent pasture in both fertilized and unfertilized conditions. The mean DIP concentration in each of several surface runoff periods was closely correlated with the amounts of inorganic phosphorus extracted by 0.1M sodium chloride from the top 5 cm of soil prior to the period. For three of the four combinations of treatments evaluated (undrained, unfertilized; drained, unfertilized; and drained, fertilized) the linear relationships obtained were similar despite large variations in the phosphorus concentrations observed. Mean DIP concentrations in surface runoff from the drained plots were consistently lower than those from the undrained plots. The relationship between the mean DIP concentrations of surface runoff and the amounts of extractable inorganic phosphorus for the undrained, fertilized plot was also linear but a greatly different gradient was obtained. Soil extraction data appear to be useful in predicting mean DIP concentrations in surface runoff from reasonably homogeneous soils under pasture. Total DIP loading correlated best with the amounts of inorganic phosphorus extracted from soil at 40-50 cm, a depth which corresponds to that of mole channels. (Auen-Wisconsin)
W77-10734

A BASIC STUDY ON APPLICATION OF SYSTEMIC INSECTICIDES: V. EFFECTS OF RAINFALL ON TOXICITY OF VAMIDOTHION AND MALATHION, (IN JAPANESE),
Shionogi Co. Ltd., Shiga (Japan). Aburahi Lab.
For primary bibliographic entry see Field 5C.
W77-10737

HEAVY METAL CONCENTRATIONS IN ORGANISMS FROM AN ACTIVELY DREDGED TEXAS BAY,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-10739

CHEMISTRY AND VEGETATION OF HIGHLY ACIDIC STREAMS,
Durham Univ. (England). Dept. of Botany.
J. W. Hargreaves, E. J. H. Lloyd, and B. A. Whitton.
Freshwater Biology, Vol. 5, No. 6, p 563-576, 1975. 2 fig, 7 tab, 23 ref.

Descriptors: *Acid streams, *Surveys, *Water chemistry, *Acid mine water, *Acidic water, Hydrogen ion concentration, Industrial wastes, Algae, Aquatic plants, Mosses, Heavy metals, Nitrogen, Phosphates, Silicates, Streams, Ponds, Varieties.
Identifiers: *England.

Highly acidic freshwater streams (pH of 3.0 or less) in England were surveyed and their water chemistry and flora reported. Fifteen sites were located, 13 of which were associated with coal mining, one with a barytes mine, and one with an industrial effluent. All sites included flowing waters, though in a number of cases stagnant pools came in direct contact with these streams. Each body of water contained high levels of heavy metals and silicate and most carried moderately high levels of phosphate and combined inorganic nitrogen. Total flora consisted of 24 algae, two mosses, and two flowering plants. Of these, three algae and one flowering plant were only found in polls. The most widespread species, Euglena mutabilis, was also often the most abundant, forming up to an 80% cover. Species in both pools and streams showed a positive correlation with pH during late summer, but revealed a negative correlation with total acidity in winter. These algal observations were also compared with similar studies of U.S. waters. Only four algal species were common to both countries. (Luedtke-Wisconsin)
W77-10744

ORTHOPHOSPHATE TURNOVER IN EAST AFRICAN LAKES,
Munich Univ. (West Germany). Zoologisches Institut.
For primary bibliographic entry see Field 5C.
W77-10752

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
H. Sievering.
Water, Air, and Soil Pollution, Vol. 5, p. 309-318, 1976. 3 fig, 3 tab, 22 ref.

Descriptors: *Mass transfer, *Aerosols, *Model studies, Diffusion, Dispersion, Fallout, Trace elements, Metals, Particle size, *Lake Michigan, Air pollution.
Identifiers: *Dry deposition, Wet deposition, Chicago(Illinois).

A model which treats transport of airborne particularate as a function of particle size couples Chicago area meterorological data through the mixed layer with laboratory and field data on water surface dry depostion. Dispersion over Lake Michigan is characterized by a diffusion equation which includes the gravitational field corrected for surface depletion, and deposition onto a smooth surface is characterized by a previously-developed equation. The model is used: (1) to estimate a minimum mass transfer efficiency by dry deposition from the Chicago area to Lake Michigan; (2) to compare this minimum with the likely maximum wet deposition; and (3) to estimate the transfer efficiency of trace metals. Results indicate that fry deposition causes 15% or more mass transfer efficiency of aerosols to the total mass transfer may be equal to or greater than wet deposition by precipitation scavenging. However, because of the function of particle size, trace metal transfer is probably dominated by wet deposition. Most trace metals had a transfer efficiency of 1 to 2% by dry deposition. It is concluded that dry deposition appeared to be a more important mechanism for mass transport than wet deposition and that particle size should always be considered in any mass transport calculations. (Luedtke-Wisconsin)
W77-10758

DETERMINATION OF INORGANIC PHOSPHORUS IN OXALATE EXTRACTS OF SOILS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
L. B. Owens, D. W. Nelson, and L. E. Sommers.
Soil Science Society of America Journal, Vol 41, No 1, p 148-149, January-February 1977. 3 tab, 8 ref. OWRT B-075-IND(1).

Descriptors: *Pollutant identification, *Phosphorus, *Analytical techniques, *Soil analysis, *Phosphorus compounds, *Chemical analysis, Phosphates, Inorganic compounds, Colorimetry, Analysis, Soil chemistry, Color reactions, Instrumentation, Testing procedures, Separation techniques, Fertilizers.
Identifiers: *Inorganic phosphorus, *Phosphorus sorption, Oxalate extracts, Extractable iron, Oxalate interference, Ascorbic acid procedure.

A simple and rapid procedure for the determination of inorganic phosphorus in acid ammonium oxalate extracts of soils was developed by modifying the ascorbic acid-molybdenum blue colorimetric method. The oxalate interference in the determination of P was overcome by addition of excess ammonium molybdate. A molar ratio of molybdate to oxalate of 2.51:1 in the final solution was required in order to eliminate the oxalate interference. (Henley-ISWS)
W77-10797

5B. Sources Of Pollution

OXYGEN-SAG IN A TIDAL RIVER,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
G. J. Macdonald, and R. N. Weisman.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE3, Proceedings Paper 13023, p 473-488, June 1977. 5 fig, 1 tab, 24 ref, 2 append.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, *Tidal streams, *Oxygen sag, Estuaries, Water quality, Dispersion, Analysis, Equations, Reaeration, Mathematical models, *Path of pollutants, Water pollution sources.
Identifiers: Tidal flow.

Freshwater flow in a tidal river was incorporated in a dimensionless solution of the derived equations for BOD and DOD, and a comparison was made between the profiles obtained with both a constant and a time variable dispersion coefficient, E. The time variation of E was expressed as the ratio of the absolute value of the oscillating velocity to a reference velocity. Flow data from the Potomac River, Washington, were used in the computer programs, and illustrative BOD and DOD profiles were presented. Increases in the river discharge decrease and translate downstream the points of maximum BOD and DOD. Time variation of the dispersion coefficient smooths both BOD and DOD profiles, as opposed to a constant value of E, and reduces their peak values. Decisions on the maximum DOD associated with a specific effluent outfall, which are based on a solution with a constant E, appear, therefore, to be conservative. (Adams-ISWS)
W77-10114

PLUTONIUM AND AMERICIUM ACTIVITIES IN THE NORTH SEA AND GERMAN COASTAL REGIONS,
Deutches Hydrographisches Institut, Hamburg (West Germany).
C. N. Murray, and H. Kantsky.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 319-328, May 1977. 4 fig, 4 tab, 17 ref.

Descriptors: *Radioactive wastes, *Radioisotopes, *Oceans, *Coasts, Sampling, Surveys, Chemical analysis, Laboratory tests, Measurements, Sediments, Sea water, Pollutants, Water pollution, *Path of pollutants, Oceanography.
Identifiers: *Plutonium, *Americium, *North Sea.

Artificial radionuclides are discharged into the North Sea from three nuclear fuel reprocessing plants, namely La Hague in Northern France, Windscale in the north west of England, and Dounreay in Northern Scotland, as well as from

fallout from nuclear weapons testing. Data were presented on the distributions of 239 + 240 Pu, 238 Pu and 241 Am in seawater from the German Bight and German Baltic coastlines as well as from other parts of the North Sea up to latitude 60 deg N. Results from the Pentland Firth in the north of Scotland and the English Channel show 239 + 240 Pu activities in seawater 5-15 times higher than North Atlantic fallout levels. The ratio 238 Pu/239 240 Pu is significantly higher in the Pentland Firth area (0.21 plus or minus 0.01) than in the Channel (0.15 plus or minus 0.02), and the difference may well be a reflection of different input sources of plutonium in these waters. German coastal seawater and sediment plutonium activities appear to be due only to fallout, the isotope ratio being about 0.06 plus or minus 0.02, a value in good agreement with accepted North Atlantic values. (Sims-ISWS)
W77-10122

UPTAKE AND RELEASE OF PETROLEUM BY INTERTIDAL SEDIMENTS AT PORT VALDEZ, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw, L. M. Cheek, and A. J. Paul.
Estuarine and Coastal Marine Science, Vol 5, No 3, p 429-436, May 1977. 2 fig, 1 tab, 18 ref. EPA R800944.

Descriptors: *Oil pollution, *Sediments, *Alaska, On-site investigations, Sampling, Coasts, Water pollution, Oil, Oil spills, Harbors, Estuaries, Bays, Sands, Silts, Tides, Tidal effects, Analytical techniques, Chromatography, Gas Chromatography, Pollution.
Identifiers: *Port Valdez(Alaska).

The uptake and release of Prudhoe Bay crude oil by intertidal sediments at Port Valdez, Alaska, were studied. In two experiments designed to simulate the stranding of a light oil slick, oil was spread on sediments daily for 5 days. Hydrocarbon content of the top 1.0 cm of the sediments was monitored for 60 days from the first oiling. The two experimental rates of oil application were 1.2 microliters/cm and 5.0 microliters/cm. In both experiments the added oil was no longer detectable on the sixtieth day. Polsible reasons for this rapid loss of petroleum by sediments were discussed. (Sims-ISWS)
W77-10123

RELATIONSHIP BETWEEN NITROGEN FIXATION (ACETYLENE REDUCTION) AND THE C:N RATIO IN A POLLUTED CORAL REEF. ECOSYSTEM, KANEOHE BAY, HAWAII,
Hawaii Univ., Honolulu. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W77-10124

EFFECTS OF ACID PRECIPITATION ON A SMALL ACID LAKE IN SOUTHERN NORWAY,
Norsk Institutt for Vannforskning, Blindern.
A. Henriksen, and R. F. Wright.
Nordic Hydrology, Vol 8, No 1, p 1-10, 1977. 2 fig, 5 tab, 12 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Acidic water, Lakes, Acidity, Acids, Peat, Water sampling, Granites, Forests, Coniferous forests.
Identifiers: *Acid precipitation, *Acid lake, *Acid rainfall, *Norway, Water research, Boitite gneisses, Peaty area.

Evidence suggests that the acidity of lakes and rivers in southern Scandinavia has increased over the past several decades. Chemical data collected in 1930-40, compared with data collected in the 1970's, indicate that the pH in soft-water lakes has decreased over 1 pH unit; the acidity is increasing 5-25% per year. Statistical analysis of pH-data in 7 major rivers in southernmost Norway indicated a doubling in acidity over the 1965-75 period. In the southernmost part of Norway, the majority of lakes and rivers are so acid that the natural fish populations are unable to survive. The cause of the acidification of the freshwaters probably is due to deposition of acid precipitation which primarily originates from the emission, oxidation, and long-range transport of sulfur and nitrogen oxides released from the burning of fossil fuels. An intensive project in research on hydrology and hydrochemistry is underway at 10 gaged watersheds and lake basins in southern Norway. Results from studies at one of the watersheds, a small acid lake called Langtjern situated in south-central Norway about 100 km northwest of Oslow, were presented. (Roberts-ISWS)
W77-10127

DETERMINATION OF DIMETHYLNITROSAMINE IN AIR, WATER, AND SOIL BY THERMAL ENERGY ANALYSIS: MEASUREMENTS IN BALTIMORE, MD.,
Thermo Electron Research Center, Waltham, Mass.
For primary bibliographic entry see Field 5A.
W77-10129

VARIATION IN CHEMICAL COMPOSITION OF THE RIVER FROME, ENGLAND, FROM 1965 TO 1972,
Freshwater Biological Association, East Stoke (England).
For primary bibliographic entry see Field 5C.
W77-10138

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
For primary bibliographic entry see Field 5C.
W77-10142

MERCURY IN WATERWAYS THAT DRAIN INTO THE WASH, IN EASTERN ENGLAND,
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.
F. Moriarty, and M. C. French.
Water Research, Vol. 11, No. 4, p. 367-372, 1977. 3 fig., 8 tab., 10 ref.

Descriptors: *Path of pollutants, *Mercury, *Water pollution sources, *Fluvial sediments, Rivers, Ditches, Analytical techniques, Fungicides.
Identifiers: *The Wash(England).

Mercury contamination levels in The Wash (eastern England) were determined by examining superficial sediments in the Rivers Nene, Welland and Witham and sediments from their principal drainage channels. Ditches adjacent to bulb-dipping with mercurial fungicides were also sampled as was the mercury content of freshwater mollusks in the area. No large-scale contamination was found but appreciable amounts of mercury were found in ditches from two out of five bulb-dipping sites tested. The highest residue in a sediment sample was 223 microgram/1 (wet weight), compared to average mercury contents of soils of 0.1 microgram/1. It was found that the rate of flow affects diffusion of mercury from a discrete source. Aquatic gastropods proved to be useful monitors for deterring intermittent mercury releases. Sediment samples indicated a good relationship between depth and the amount of mercury. Sediments with several mcirogram/1 mercury lost little or no mercury when air-dried at room temperature. The indication was that mercury is retained very firmly in the sediments. (Auen-Wisconsin).
W77-10152

COMPARATIVE LIMNOLOGY OF DIFFERENTIALLY REGULATED SECTIONS OF A COLORADO MOUNTAIN RIVER,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 6G.
W77-10155

CHEMICAL QUALITY OF IRRIGATION WATER POLLUTED WITH NITROGEN COMPOUNDS, (IN JAPANESE),
National Agricultural Experiment Station, Hokkaido (Japan).
Y. Tokunaga, J. Asano, and Y. Honjho.
Bull Tokai-Kinki Natl Agric Exp Stn. 24, p 132-150, 1972.

Descriptors: *Water quality, *Irrigation water, *Nitrogen compounds, Water pollution sources, Path of pollutants, Nitrates, Nitrites, Chemical wastes, Industrial wastes, Sewage, Chemical oxygen demand.
Identifiers: *Japan(Aichi-Nara-Osaka).

A study of the chemical quality of irrigation water polluted with nitrogen compounds was carried out in paddy field regions of Aichi, Nara and Osaka Prefectures (Japan), respectively, in 1969, 1970 and 1971. The origins of pollutants were wastes of starch manufacture, dye and textile works and urban sewage. The measured values of EC (electrical conductivity), total solids, NH4-N, T-N(total N), COD (chemical oxygen demand) and Cl of poluted water were higher than non-polluted water. The concentration ratios of polluted water to non-polluted water were significant among EC<COD,Cl<T-N, NHR-N. Positive simple correlations were significant among EC, total solids, NH4-N, T-N, COD and Cl of polluted and non-polluted water. The values of correlation coefficients between T-N and other items were higher than the others; measurement of T-N may be important as an index for polluted water with N compounds. Chemical quality of polluted water reflected the origins of pollutants. The concentrations of NH4-N, T-N and COD tended to decrease and NO3-N (nitrate N) and pH tended to increase as the stream flowed away from the contaminating point. This is probably a qualitative part of self purification of foul water. The pH value of polluted water changed remarkably with time by stirring or standing undisturbed at room temperature; the change in CO2 concentration in water directly caused the variation in pH value. With the progress of pollution by N compounds, the concentration of NO3-N was reduced, occurring in reductive conditions. Most of the simple correlations were shown to be the observed relations by calculating the coefficients of partial correlation for each analytical item.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10156

MODELING THE PERFORMANCE OF FEEDLOT-RUNOFF-CONTROL FACILITIES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
J. K. Kowlliker, H. L. Manges, and R. I. Lipper.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 6, Nov-Dec 1975, p. 1118-1121. 2 fig, 3 tab, 9 ref.

Descriptors: *Feed lots, *Runoff forecasting, *Surface runoff, *Model studies, Watershed management, Land management, *Kansas, Estimating, Runoff, Rainfall runoff relationships, Precipitation(Atmospheric), Management, *Path of pollutants, Water pollution.
Identifiers: *Runoff control facilities.

A watershed predictive model using daily precipitation and temperature was developed to evaluate expected performance of feedlot-runoff-control facilities under Kansas conditions. As a tool to estimate expected performances of various

designs and operational criteria, the model considers feedlot surface, runoff control structure, disposal capacity, soil conditions and operational criteria for disposing of the runoff onto agricultural land. Use of the model shows that in Kansas, a runoff control structure large enough to contain the volume of a 10-year 24-hour rainstorm from a feedlot and dispose of 10 percent of the volume per disposal day would control 91.3-99.4 percent of the runoff from an unsurfaced feedlot; one large enough to contain the volume of a 25-year 24-hour precipitation event would control 93.0-100 percent of the runoff. A further expectation to run off an unsurface feedlot while about 44 percent is expected to run off a surfaced lot. Based on these results, evaporation pond sizes in Kansas--it they are to provide control as good or better than land disposal systems--should be 6 ft deep for a surface area 120 percent of the minimum and 4 ft deep for a surface area 150 percent of the minimum. (Harris-Wisconsin).
W77-10157

INDICATOR VALUE OF BIOSESTON AND PERIPHYTON FOR EVALUATION OF POLLUTION DEGREE OF FLOWING WATERS, (IN POLISH),
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
S. Golowin.
Pol Arch Hydrobiol. 18(4), p 367-379, 1971.

Descriptors: *Periphyton, *Seston, *Bioindicators, Water pollution, Indicators, Rivers, Path of pollutants.
Identifiers: *Bioseston, *Poland, Odra River, Sleza River, Olawa River, *Vector analysis, *Saprobity.

Investigations of bioseston and periphyton of 3 rivers, the Odra, Sleza and Olawa (Poland), were interpreted saprobiologically by vector analysis. The results are presented as longitudinal saprobiological profiles, illustrating the changes in saprobity along the river's streams at different testing seasons. Extensive differences in the indications of each of the analyzed sets of organisms were found. The curves of bioseston saprobity of the Odra River were different in different seasons and thus extensive oscillations of saprobity in individual sampling stations were observed during the yearly cycle. The ranges of periphyton saprobity in individual stations oscillated within a relatively narrow range of values approaching the averages from extreme bioseston indications. At the stations situated below the outlets of sugar mill effluents, bioseston saprobity in the Sleza and Olawa gradually increased during the sugar season, bioseston saprobity at these stations fell to its pre-season level. Periphyton, on the other hand, reached its maximum saprobity below pollution sources very quickly during the season and kept its maximum saprobity for several months. Comparative analyses show that in evaluating a present state of water purity, indications of bioseston can and should be used, while indications of periphyton saprobity refer to an indefinite past period and to the conditions in near-to-bottom or littoral fluvial zones.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10158

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W77-10159

PROBLEMS AND POLICY ALTERNATIVES: AGRICULTURE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W77-10161

THE TECHNICAL PERSPECTIVE (WHAT IS QUALITY WATER),
Texas Univ., Austin. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W77-10162

PROBLEMS AND POLICY ALTERNATIVES: MINING,
Environmental Protection Agency, Springfield, Ill.
For primary bibliographic entry see Field 5G.
W77-10163

PROBLEMS AND POLICY ALTERNATIVES: CONSTRUCTION,
Hittman Associates, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-10164

HEAVY METALS IN CHESAPEAKE BAY SEDIMENTS,
Maryland Univ., College Park. Water Resources Research Center.
S. E. Sommer, G. Diachenko, A. Pyzik, and H. Siegrist.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 655, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 41, 37 p, 12 fig, 5 tab, 38 ref. OWRT A-026-MD(1). 14-31-001-5020.

Descriptors: Interstitial waters, *Sediments, *Bottom sediments, Rivers, *Heavy metals, *Chesapeake Bay, *Trace elements, Copper, Sediment-water interfaces, *Distribution, *Path of pollutants, Nickel, Lead, Carbon, Cobalt, Chromium.
Identifiers: Magothy River, Patuxent River, Potomac River, Severn River.

The sediments and interstitial waters of four rivers of the Chesapeake Bay the Potomac, Patuxent, Severn and Magothy, were analyzed for trace metals (Cu, Ni and Pb in the waters, Cu, Ni, Pb, Co, Cr, V and C in the sediments) to determine their distribution as a function of natural and man induced processes. Cu and Pb increase in the sediments as a function of proximity to pollution sources, but interstitial water composition does not always reflect this association. Rather, the degradation of organic matter and organic solubilization appears to control interstitial water metal content. When organic matter is removed by man's influence, metal content of interstitial waters is markedly reduced. Analyses for copper, zinc, nickel and lead in sediments of the Patuxent River Estuary, Md., show marked depletions at sites near the Chalk Point Power Plant outfall. The depletion of copper and lead in the sediments, and reduction of organic carbon, dissolved oxygen and pore fluid metal levels indicate that chlorine used to clean the Plant's cooling apparatus is oxidizing the sediment and solubilizing the metals. The reaction between goethite, -FeOOH, and aqueous bisulfide ion HS(-), was studied under conditions representative of estuarine sediments to determine the effects on the concentration and distribution of trace metals. The concentration-time curves of the following species were determined by spectrophotometric methods: total sulfide, dissolved sulfide, acid soluble sulfide, thiosulfate, sulfite, elemental sulfur, and dissolved (< 0.1 micro) iron. Polysulfides (S4(=) and S5(=)) were determined from ultraviolet absorbance measurements, while the hydrogen ion activity was measured with a pH electrode. Elemental sulfur, both as free and polysulfide sulfur was the major sulfide oxidation product. Thiosulfate comprised about 14 plus or minus 8% of the oxidation products on the basis of electron balance.
W77-10174

INFLUENCE OF ORGANIC CARBON AND MICROORGANISMS ON IRON AND SULFIDE CONCENTRATIONS IN GROUNDWATER,
Missouri Univ., Columbia. Dept. of Geology.
A. B. Carpenter, and R. N. Stoufer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 640, Price codes: A05 in paper copy, A01 in microfiche. Completion Report June 22, 1977; 85 p, 18 fig, 10 cat, 55 ref, append. OWRT B-077-MO(4), 14-31-0001-3608.

Descriptors: *Carbon, *Microorganisms, *Iron, Sulfides, *Groundwater, Water supply, Water wells, *Missouri, Dissolved solids, Water pollution sources, Oxidation-reduction potential, Landfills, Leaching, Nitrogen, Phosphorus, Percolation, *Leachate, Absorption.
Identifiers: *Organic carbon.

Twenty water supply wells in northern Missouri were sampled to determine the relationships between dissolved organic carbon, microorganisms, iron, and sulfide in unpolluted water. The data suggest a poor correlation between redox potential and the organic carbon content of the water. The data for nitrate-ammonia and sulfate-sulfide indicate that most of the samples were not in internal equilibrium with respect to oxidation-reduction reactions. Considerable data were obtained on groundwater systems with high concentrations of organic carbon. Most of these areas were affected by leachate from sanitary landfill operations. Landfill leachates have very different inorganic nitrogen to total phosphorus ratios than sewage lagoon or septic tank effluent. This ratio is an effective method for distinguishing between these two sources of pollutants in ground water. Percolation experiments were conducted to evaluate the capacity of the kaolinitic soils to remove organic carbon from leachate. Less than 5 percent of the organic carbon is removed from leachate by absorption or entrapment by this kind of treatment.
W77-10183

RELATION OF CLIMATE TO LEACHING OF SOLUTES AND POLLUTANTS THROUGH SOILS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
C. B. Tanner.
Final Report to NOAA, Environmental Data Service, May 20, 1977. 39 p, 9 fig, 9 tab, append. Grant NG-34-72.

Descriptors: Soil physics, *Soil water movement, *Pollutants, *Climates, *Nitrates, *Leaching, Groundwater, Evapotranspiration, Irrigation, *Path of pollutants, Water pollution sources, Soil contamination.

The original study had two objectives: (1) to test whether a simple soil physics model of nitrate leaching could be combined with analysis of weather records to model nitrate movement to the water table. This embraces both the concentration distributions in the soil and the total flux. Leaching is greatest when heavily fertilized and irrigated crops are grown on sandy soils. (2) the second objective was to determine whether the leaching information could be used to improve irrigation and fertilizer management to minimze leaching and improve management efficiency of crops where nitrogen and irrigation are used intensively. (NOAA)
W77-10187

TRITIUM IN THE MONITORING OF WATER SUPPLY.
University of the Witwatersrand, Johannesburg (South Africa). Nuclear Physics Research Unit.
For primary bibliographic entry see Field 2F.
W77-10196

THE ROLE OF EFFLUENTS IN THE SPREAD OF SALMONELLAE, (IN DUTCH),
For primary bibliographic entry see Field 5C.
W77-10231

FISHERY WASTE EFFLUENTS: A SUGGESTED SYSTEM FOR DETERMINING AND CALCULATING POLLUTANT PARAMETERS,
National Marine Fisheries Service, Kodiak, Alaska. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5A.
W77-10242

HEALTH AND ECOLOGICAL ASPECTS OF COBALT-60 TRANSFER IN SEAWATER FOOD CHAIN TYPICAL OF AN INTERTIDAL MUDFLAT,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de Radioecologie.
For primary bibliographic entry see Field 5C.
W77-10257

NITRIFICATION POTENTIAL OF RIVER ENVIRONMENTS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W77-10265

THE RELEASE OF NITROGEN FROM SULFUR-COATED UREA AS AFFECTED BY SOIL MOISTURE, COATING WEIGHT, AND METHOD OF PLACEMENT,
Woods (M. J.) and Associates, Dublin (Ireland).
For primary bibliographic entry see Field 2G.
W77-10270

PHOSPHORUS SORPTION AND DESORPTION CHARACTERISTICS OF SOIL AS AFFECTED BY ORGANIC RESIDUES,
Idaho Univ., Moscow. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 2G.
W77-10275

TRIPOLYPHOSPHATE AND PYROPHOSPHATE HYDROLYSIS IN SEDIMENTS,
Monsanto Philippines Inc., Makati.
R. W. Blanchar, and D. C. Riego.
Soil Science Society of America Journal, Vol. 40, No. 2, p 225-229, March-April 1976. 3 fig, 2 tab, 22 ref. OWRT, A-059-MO(2).

Descriptors: *Sediments, Sedimentation, *Hydrolysis, *Phosphates, Phosphorus, Nutrients, Lake sediments, Missouri, Pollutant identification, Rivers, Streams.
Identifiers: *Tripolyphosphates, *Pyrophosphates.

The rate of hydrolysis of tripolyphosphate (TPP) and pyrophosphate (PP) in river, creek, and lake sediments was determined. Half-lives for the hydrolysis of TPP and PP ranged from 1.6 to 2.6 and 6.7 to 27.4 days, respectively. The influence of temperature, biological activity, and pH on the rate of TPP and PP hydrolysis was investigated using Flat Branch Creek sediment. The rate of TPP and PP hydrolysis increased with increasing temperature. The activation energy was 5.415 cal/mole for TPP and 10,412 cal/mole for PP. TPP and PP hydrolyzed slower in sediment which had been autoclaved than in non-sterilized sediment. The half-life for TPP hydrolysis was 1.76 day at pH 5, 1.61 day at pH 7, and 2.16 day at pH 9. The reate of PP hydrolysis was increased as pH increased from 5 to 7 to 9 as indicated by half-lives of 13.7, 10.0 and 7.3 days, respectively. When TPP was added to the sediment as a Ca5-(P3010)2 precipitate, the rate of hydrolysis was slower than when TPP was added as a solution. (Skogerboe-Colorado State)
W77-10285

GASEOUS LOSS OF AMMONIA FROM SULFUR-COATED UREA, AMMONIUM SULFATE, AND UREA APPLIED TO CALCAREOUS SOIL (PH 7.3),
Woods (M. J.) and Associates, Dublin (Ireland).
For primary bibliographic entry see Field 2G.
W77-10287

A GENERAL PURPOSE UNIVARIATE PROBABILITY MODEL FOR ENVIRONMENTAL DATA ANALYSIS,
Environmental Protection Agency, Washington, D. C., Office of Research and Development.
For primary bibliographic entry see Field 6G.
W77-10291

OPTIMAL DESIGN OF MECHANICAL AERATION SYSTEMS FOR THERMALLY AND ORGANICALLY POLLUTED STREAMS,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-10293

MODELLING, SIMULATION AND CONTROL OF STOCHASTIC SYSTEMS WITH APPLICATIONS IN WASTEWATER TREATMENT,
Oxford Univ. (England). Dept. of Engineering Science.
For primary bibliographic entry see Field 5D.
W77-10294

A STOCHASTIC MODEL FOR THE SIMULATION OF THE TEMPERATURE OF A WATERCOURSE,
Electricite de France, Chatou. Div. Exchanges Atmospheriques.
For primary bibliographic entry see Field 2A.
W77-10300

ANALYTICAL MODEL OF DISPERSION IN TIDAL FJORDS,
Nova Scotia Technical Coll., Halifax. Dept. of Chemical Engineering.
S. T. Wang, A. F. McMillan, and B. H. Chen.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13073, p 737-751, July 1977. 8 fig, 19 ref, 2 append.

Descriptors: *Dispersion, *Fjords, *Tidal effects, *Model studies, Mathematical studies, Sewage disposal, Waste disposal, Industrial wastes, Pollutants, *Path of pollutants, Water pollution, Tides, Coasts, Hydrodynamics.

Using the integral transforms technique, the unsteady three-dimensional advective-diffusion equation was solved analytically for the dispersion of pollutants from an instantaneous point source in open channels of finite width. The flow velocity through the channel was the mean current velocity, which was assumed to vary sinusoidally with time but linearly with water depth. The effect of first-order reactions is to reduce the concentration level throughout the channel. The spread of pollutants in the direction of mean flow is accelerated as a result of the existance of a vertical shear. The width of the channel is important, as is the boundary in the y direction that profoundly affects the horizontal dispersion when the source is close to the bank, but the effect diminishes as the source is moving farther away from the bank. These findings, as well as others, were examined and illustrated graphically. (Sims-ISWS)
W77-10303

ANOXIC, HYPERSALINE BASIN IN THE NORTHERN GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-10319

MASS BALANCE MONITORING OF LAND APPLICATION SITES FOR WASTEWATER RESIDUALS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
J. L. Smith, D. B. McWhorter, and T. J. Trout.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 2, Paper No. 76-2065, p 309-312, March-April 1977. 4 fig, 2 tab, 8 ref.

Descriptors: *Waste water disposal, *Sludge disposal, *Soils, Groundwater, Leachates, Leaching, Heavy metals, Groundwater movement, Soil amendments, Wastes, Sewage sludge, Water table, Water levels, On-site investigations, Soil contamination, Water pollution, Pollutants, Monitoring.

The soil can serve as a receiving medium and a final form of treatment by removing and decomposing various constituents in the sludge. Land application, when properly controlled, incorporates ultimate disposal with resource recovery. This paper proposed use of the mass balance concept for predicting groundwater quality and buildup of heavy metals in soils due to application of wastewater sludges. The concept is based on the principle of continuity of mass and an idealization of the flow system. Data from the Boulder, Colorado municipal sludge applications site were used to illustrate practical application of the concept. Mass balance reduces the lag time between application and measurement and uses measurement made prior to dilution of potential contaminants. A major deficiency in the concept is that, while it predicts a buildup of heavy metals in the soil, it does not indicate their availability to plants. However, other research has indicated that there is no cumulative effect of heavy metals and that plant uptake is not normally a problem in soils having near neutral pH. (Sims-ISWS)
W77-10326

TRANSPORT PHASES OF TRANSITION METALS IN THE AMAZON AND YUKON RIVERS,
Delaware Univ., Lewes. Marine Studies Complex.
For primary bibliographic entry see Field 2J.
W77-10328

PROBLEMS OF HEAT STORAGE IN AQUIFERS,
Eidgenoessische Technische, Zurich (Switzerland). Institut fur Geophysik.
D. Werner, and W. Kley.
Journal of Hydrology, Vol. 34, No. 1/2, p 35-43, July 1977. 3 fig, 7 ref.

Descriptors: *Thermal pollution, *Storage, *Heated water, *Aquifers, On-site investigations, Model studies, Mathematical models, Underground storage, Heat transfer, Diffusion, Convection, Temperature, Groundwater, Powerplants, Nuclear powerplants, Wells, Injection wells.

A hydrothermic field experiment near Krefeld (Federal Republic of Germany) was used to study the propagation of heat in groundwater. For two months, water at a temperature of 45 C was fed through a well pipe to the water-bearing strata, the distribution of temperature in the surrounding space was measured, and its variation with time was observed. A theoretical model was developed to simulate the field experiment. The model consisted of a time-spaced differential method with the help of which good conformity between theory and experiment was obtained. The aim of the study was to ascertain the physical bases for the storage of heat in groundwater. The technoeconomic and environmental problem was posed because of the enormous quantities of cooling water necessary in the operation of atomic power stations. A functional theoretical model can help to decide how far the idea of storing heat in an aquifer is technically feasible. (Sims-ISWS)
W77-10332

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
For primary bibliographic entry see Field 5G.
W77-10355

HERBICIDE TRANSPORT IN SOIL UNDER CENTER PIVOT IRRIGATION SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agronomy.
T. L. Lavy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 777, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, June 1977. 90 p, 8 fig, 3 tab, 61 ref. OWRT B-030-NEB(1), 14-31-0001-5087.

Descriptors: *Herbicides, Irrigation, Leaching, *Percolation, Irrigation practices, Irrigation systems, *Path of pollutants, Water pollution sources, Soils, Soil moisture, Soil profiles.
Identifiers: Center pivot irrigation.

A series of plant competition studies has shown that plants effectively compete for the available herbicide in soil solution. Extrapolating this finding to field situations illustrates the role that plants play in (1) preventing water from percolating through the soil profile and (2) removing phytotoxic materials from the water. Development of a centrifugal technique to remove low levels of moisture from soil allow the researcher to observe the concentration of herbicide present in the soil solution available to the growing plant. Rapid dissipation of atrazine under sandy irrigated conditions was primarily due to non-biological degradation. Although leaching of atrazine through 90 cm of a loamy sand in an irrigated field was shown, the percentage of the amount supplied was less than 2%. Mobility studies of labeled 35SO4 and 32PO4 was not shown. Comparisons between SO4, atrazine and picloram showed the SO4 to be most mobile. The fraction of atrazine free to move in a moist soil environment can be increased by increasing the soil moisture content or by decreasing the salt content of the soil solution.
W77-10366

IMPACTS OF NUCLEAR RELEASES INTO THE AQUATIC ENVIRONMENT.
International Atomic Energy Agency Vienna (Austria).
For primary bibliographic entry see Field 5C.
W77-10384

RADIOLOGICAL IMPACTS OF RELEASES FROM NUCLEAR FACILITIES INTO AQUATIC ENVIRONMENTS-USA VIEWS,
Energy Research and Development Administration, Washington, D.C. Div. of Biomedical and Environmental Research.
C. L. Osterberg.
In: Impacts of Nuclear Releases in to the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 25-35, 6 tab, 5 ref. IAEA-SM-198/58.

Descriptors: *Environmental effects, *Water pollution, Nuclear wastes, Nuclear reactors, Fallout, Radioisotopes, Radioactive wastes, Radioactivity effects, Columbia River, Pacific Ocean, *United States.

The paper reviews the history of radionuclide releases of the past three decades by taking a particular look at two major events which led to large-scale releases: the release of approximately 1000 curies a day to the Columbia River and the Pacific Ocean by Hanford Laboratories and releases through fallout. No harmful effects have been observed from the Hanford Laboratories release and releases from fallout are dying. (See also W77-10384) (Chilton-ORNL)
W77-10386

ETUDE DE L'INFLUENCE DU CADMIUM STABLE SUR LE TRANSFERT DU ZINX-65 EN ECOSYSTEME IRRIGUE PAR SUBMERSION (RIZIERE IRRIGUEE), (STUDY OF THE INFLUENCE OF STABLE CADMIUM ON THE TRANSFER OF ZINC-65 IN AN ECOSYSTEM IRRIGATED BY SUBMERSION (IRRIGATED RICE FIELD),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-10387

STUDIES ON RARE EARTH ELEMENTS IN SEAWATER AND UPTAKE BY MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5C.
W77-10390

LE TRANSFERT DU ZINC-65 DE SEDIMENTS A DES LARVES DE CHIRONOMIDES ET A UN POISSON D'EAU DOUCE ET L'EFFET DU CADMIUM SUR CE TRANSFERT, (TRANSFER OF ZINC-65 FROM SEDIMENTS TO CHIRONOMID LARVAE AND TO A FRESHWATER FISH AND THE EFFECT OF CADMIUM ON TRANSFER),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
For primary bibliographic entry see Field 5C.
W77-10393

THE BEHAVIOUR OF SR90 AND CS137 IN THE WATERS OF THE BALTIC SEA,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
A. G. Trusov, L. M. Ivanova, V. S. Zolotukhina, and L. I. Gedeonov.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 133-144, 3 fig, 3 tab, 13 ref. IAEA-SM-198/54.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Strontium, *Cesium.
Identifiers: *Baltic Sea.

Changes in average values of Sr90 and Cs137 in the Baltic Sea over the past several years are estimated. Sr90 concentrations appear to generally follow changes in the rate of global fall-out with a considerable delay. Cs137 distributions were much smaller than those of Sr90. It is reasoned that the decrease of Sr90 is due to the shallowness and the isolation of the Baltic Sea. Low concentration of Cs137 is explained by the sorption processes in fresh water and by the flow of Cs depleted water from rivers. (See also W77-10384) (Chilton-ORNL)
W77-10394

EXPERIMENTAL STUDIES ON PLUTONIUM KINETICS IN MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. Fowler, M. Heyraud, and T. M. Beasley.
In:Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 157-177, 4 tab, 9 fig, 31 ref. IAEA-SM-198/23.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutants, Radioisotopes, Plutonium, Aquatic environment, Shrimp, Mussels, Worms, Sea water, *Biota.

Pu 237 was used to make measurements with standard NaI(T1) scintillation techniques on mussels, shrimp and worms from the marine environment. Results showed that plutonium was accumulated to a much greater degree in shell than in soft parts of molluscs and crustacea. Moulting strongly influenced the degree of uptake in shrimp, with cast moults containing large fractions of the shrimps Pu content. More than 80% of the mussels plutonium accumulation was found in the shell. Concentration factors in worms reached approximately 200. It was indicated that if the different plutonium isotopes found in nature are present in the same physico-chemical form, aquatic organisms may well be unable to discriminate between them during either accumulation or subsequent excretion phases. (See also W77-10384) (Chilton-ORNL)
W77-10396

ADSORPTION-DESORPTION CHARACTERISTICS OF PLUTONIUM AND AMERICIUM WITH SEDIMENT PARTICLES IN THE ESTUARINE ENVIRONMENT, STUDIES USING PLUTONIUM-237 AND AMERICIUM-241,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
C. N. Murray, and R. Fukai.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 179-192, 8 fig, 2 tab, 17 ref. IAEA-SM-198/25.

Descriptors: *Environmental effects, *Water pollution, Sorption, *Adsorption, *Plutonium, Fresh water, Sea water, Sediments.
Identifiers: *Desorption, *Americium.

Data demonstrated that the particles of Pu (IV) in river water and sea water are relatively homogeneous and not dependent on filter pore size used for the initial filtration nor on the salinity of the medium. However, particle formation of Am(III) in river water and sea water appeared to be influenced by colloidal substance in the medium and there was an appreciable size distribution of the particles formed. Particle formation of Pu(IV) was lower than Am, suggesting possible complex formations with carbonate and biocarbonate. Under natural conditions, the major fractions of Pu (III, IV) and Am (III) are likely to become particles larger than 0.45 microm, while a greater part of Pu (VI) may stay in solution. The desorption of Pu and Am from fresh water sediment in normal sea water was 5-15%. Lowering of the pH of sea water to 7, could double the desorption of Am while the Pu desorption would remain more or less unchanged. Addition of sewage effluent resulted in small but measurable effects on the adsorption-desorption characteristics of Pu. (See also W77-10384) (Chilton-ORNL)
W77-10397

PLUTONIUM IN THE AQUATIC ENVIRONMENT AROUND THE ROCKY FLATS FACILITY,
Dow Chemical Co, Golden, Colo. Rocky Flats Div.
M. A. Thompson.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 213-226, 7 tab, 4 fig, 3 ref. IAEA-SM-198/38. AT(29-1)-1106.

Descriptors: *Environmental effects, *Water pollution, *Plutonium, Waste water(Pollution), Sediments, Public health, Water quality, *Colorado.
Identifiers: *Rocky Flats Plant(Colo).

An estimate has been made of the location of the plutonium releases with waste water over a period of 22 years of operation of the Rocky Flats Plant. Even considering the very conservative assumption that the plutonium concentration in water due to Rocky Flats operations is 0.01 pCi/l, only a small fraction of this released plutonium concentrates in biological systems or in man. The majority of the plutonium released through surface water has been contained in the sediments of the plant holding ponds with small amounts being found in the sediments of the draining creek and in the sediments of the receiving reservoir. No evidence has

been found to suggest that exposure to such low levels of plutonium present any health hazard to man or cause any damage to biological systems. (See also W77-10384) (Chilton-ORNL)
W77-10399

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
M. A. Wahlgren, and J. S. Marshall.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 227-243, 6 tab, 4 fig, 23 ref. IAEA-SM-198/39.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Plutonium, Cesium, Strontium, Absorption, Turnovers, Path of pollutants, *Lake Michigan, Seasonal, *Lake sediments.
Identifiers: Biogeochemical properties, Cycling, Residence time.

Pu 239, 240 and Cs 137 show similar biogeochemical properties such as turnover times and associations with seston fractions. There was a strong inverse relationship between concentration factors for Pu 239, 240 in organisms surveyed and their tropical level. The opposite behavior was noted for Cs 137. The concentration of Pu in plankton was strongly correlated with ash content. Sorption of plutonium by phytoplankton, and subsequent settling of phytodetritus, and zooplankton fecal pellets was postulated to account for the rapid removal of plutonium from the epilimnion during July and August. Pu 239, 240, Cs 137, and Sr 90 showed comparable biogeochemical behavior in all five Great Lakes, based on a set of comparison samples. The fraction of Pu 239, 240 and Cs 137 present in the water after a number of years can be related to the mean depth of the lake. (See also W77-10384) (Chilton-ORNL)
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
D. N. Edgington, and J. A. Robbins.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 245-260, 6 fig, 2 tab, 20 ref. IAEA-SM-198/40.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Plutonium, Cesium, *Lake Michigan, Limnology, Sediments, Deposition(Sediments), *Lake sediments.

Pu 239, 240 and Cs 137 from stratospheric fallout were measured to predict depositional patterns. 97% of Pu 239, 240 and 95% of Cs 137 entering lake Michigan from fallout was found in the sediments. Data indicated the scavenging of Pu 239, 240 and Cs 137 appears to occur at the same overall rate but that it is controlled by different processes in the water column. Sedimentation rates varied by more than an order of magnitude. Total content of Pu 239, 240 and Cs 137 was strongly correlated with mass-sedimentation rate resulting in large areas of the lake where there is virtually no deposition and other areas where the total content of the radionuclides per unit area is greater than would be expected. The shape of profiles in areas of high and low sedimentation suggests a redistribution of the radioactivity which has already been deposited in the sediments. Any monitoring schemes to determine the long-term fate of effluents from nuclear power reactors must take accout of the limnological properties of the receiving body of water. (See also W77-10384) (Chilton-ORNL)
W77-10401

CONSEQUENCES DU DEPLACEMENT DES SEDIMENTS SUR LA DISPERSION DES RADIONUCLEIDES, (THE EFFECT OF SEDIMENT DISPLACEMENT ON THE DISPERSAL OF RADIONUCLIDES),
Electricite de France, Chatou.
R. Schaeffer.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 263-276, 4 fig, 2 tab, 1 append, 7 ref. IAEA-SM-198/16

Descriptors: *Environmental effects, *Water pollution, Sedimentation, Deposition(Sediments), Radioisotopes, Sediment transport, *Dispersion, *Path of pollutants.

Since the bulk of discharged radionuclides are adsorbed by sediments in water courses, it might be assumed that the volumetric activity of the water decreases with distance from the disposal point in an approximately expontential manner. It is reported that the bottom transport of the sediments reverses direction so that their activity increases progressively in a downstream direction and may reach a maximum a great distance away from the disposal point after a period of time. Based on this variation of sediment activity in time and in space, it was concluded that a limited number of measurements repeated at a single point is not representative. (See also W77-10384) (Chilton-ORNL)
W77-10402

CONCENTRATION OF RADIOACTIVE COBALT BY SEAWEEDS IN THE FOOD CHAIN,
National Inst. of Radiological Sciences, Chiba (Japan).
M. Nakahara, T. Koyanagi, and M. Saiki.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 301-312, 4 fig, 3 tab, 15 ref. IAEA-SM-198/20

Descriptors: Environmental effects, *Water pollution, *Radioisotopes, Cobalt, Path of pollutants, Absorption, Algae, Marine algae, Mollusks, Food chains.

Radioisotope tracer techniques were used to study the uptake, distribution and excretion of Co60 in various kinds of seaweeds under laboratory condition. Rapid uptake was seen in the initial stage, followed by slow increase of the concentration factor. Higher concentration factors were obtained in Sargassum thunbergii than in Laminaria japonica and Eisenia bicyclis. Transfer was studied by feeding abalones with Co60 labelled seaweed. Absorption rate calculated two days after feeding showed that abalones obtained 47% through Laminaria japonica and Ulva pertusa, 31% through Undaria pinnatifida and 26% through Laminaria bicyclis. It was concluded that the accumulation of radioactive cobalt by mollusca is affected by the species of seaweeds as food. Autoradiography of abalone samples showed a high concentration of ingested radioactive cobalt in the midgut gland. (See also W77-10384) (Chilton-ORNL)
W77-10404

TRANSPORT AND ACCUMULATION OF RADIOCOBALT IN THE MARINE SEDIMENT OF URAZOKO BAY,
National Inst. of Radiological Sciences, Chiba (Japan).
Y. Nagaya, and K. Nakimura.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 313-329, 6 fig, 7 tab, 15 ref. IAEA-SM-198/21.

Descriptors: Environmental effects, *Water pollution, *Radioisotopes, Nuclear wastes, Cobalt, Cesium, Sediments, Sorption.

The concentration of fallout Cs 137 in sediments was used as a measure of sorption capability. The transport and accumulation of Co60 released from a nuclear power plant were investigated by comparing the ratio of Co60 and Cs137 concentrations in the sediment. No seasonal variations were observed in the distribution pattern of the Co60/Cs137 ratio. Contamination was found to vary as a function of distance from the discharge outlet. Contamination appears to be spreading gradually from the bay to outer regions. An apparent equilibrium has been established among the factors affecting the increase and decrease of Co60 in the sediments. As long as the release of radionuclides remains at the present rate, or even if the discharge rate is decreased, approximately the same level of Co60 will be maintained in the sediment for a considerably long time. (See also W77-10384) (Chilton-ORNL)
W77-10405

HEALTH CRITERIA FOR ESTIMATING ACCEPTABLE CONTAMINATION OF COASTAL WATERS BY RADIONUCLIDES,
Ministerstvo Zdravookhraneniya SSR, Moscow. Institut Biofiziki.
D. I. Gusev.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 363-373, 4 tab, 8 ref. IAEA-SM-198/56.

Descriptors: *Environmental effects, *Water pollution, Public health, Radioisotopes, *Radioactivity, Coasts, Sea water.

Permissible levels of seawater contamination near beaches which are periodically washed by radioactive water are discussed. Attention is given to working limits on radionuclide concentrations in seawater, standardized for coastal water where fishing takes place and where edible seaweeds and bottom invertebrates are collected. Standard coefficients expressing radiation dose to critical organs of man in the uptake of radionuclides by the digestive tract can be used to estimate individual and collective doses to the population. (See also W77-10384) (Chilton-ORNL)
W77-10408

CONVENTIONAL AND RADIOACTIVE POLLUTANTS OF INLAND WATERS IN AUSTRIA,
Federal Inst. for Water Control, Vienna (Austria).
L. J. Ottendorfer.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 395-403, 4 fig, 5 ref. IAEA-SM-198/36.

Descriptors: Environmental effects, *Water pollution, Radioactivity, *Monitoring, Nuclear powerplants, International commissions.
Identifiers: Guidelines, *Austria.

Following large-scale nuclear tests since 1961, Austrian surface water bodies and the atmosphere have been monitored for radioactive contamination. The Federal Institute for Water Quality collects and analyzes samples from 6 selected points on a monthly basis. The data collected from these stations serves as the guidelines for the issue of licenses for nuclear power plants and the limits for radiological releases. The influence of already existing and planned nuclear power stations in neighboring countries is also considered. Some international organizations have expressed interest in multinational surveying and monitoring programs and these are mentioned. (See also W77-10384) (Chilton-ORNL)
W77-10410

ASSESSMENT OF DOSES IN THE ENVIRONMENT FOR LIQUID RELEASES FROM NUCLEAR POWER REACTORS,
Nuclear Regulatory Commission, Washington, D. C. Div. of Technical Review.
For primary bibliographic entry see Field 5C.
W77-10411

A SYSTEM OF RADIATION MONITORING, AND METHODS AND EQUIPMENT FOR MEASURING WATER OF LOW SPECIFIC ACTIVITY,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. Institut Atomnoi Energii.
Yu. V. Sivintsev, and I. V. Kurchatov.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 441-458, 5 fig, 14 ref. IAEA-SM-198/53.

Descriptors: *Environmental effects, *Water pollution, Nuclear powerplants, *Radioactive wastes, *Monitoring, Analytical techniques, Pollutant identification.
Identifiers: Low specific activity.

Procedures are discussed for monitoring waters of low specific activity in relation to criteria for protection of populations and the environment near nuclear power plants. A discussion of background, efficiency, and sensitivity of laboratory equipment for gamma spectrometric analysis is included. (See also W77-10384) (Chilton-ORNL)
W77-10414

RADIOLOGICAL EFFECTS OF A NUCLEAR POWER PLANT ON A RIVER SYSTEM, AS DEMONSTRATED BY THE GUNDREMMINGEN BWR ON THE DANUBE,
Bayerische Biologische Veruchsanstalt, Munich (West Germany).
For primary bibliographic entry see Field 5C.
W77-10415

THE FISH/WATER ACCUMULATION FACTOR-AN IMPORTANT PARAMETER FOR DETERMINING THE ENVIRONMENTAL CAPACITY OF SURFACE WATERS,
Board of Nuclear Safety and Radiation Protection, Berlin (East Germany).
E. Ettenhuber, and W. Rohnsch.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 473-482, 4 fig, 2 tab, 6 ref. IAEA-SM-198/15.

Descriptors: *Environmental effects, *Water pollution, Surface waters, Fish, Radioactivity, Radioactive wastes, Fish farming, Food chain.
Identifiers: *Accumulation factors, Germany.

Cs137 accumulation factors were determined in fish from five bodies of water (Greifswalder Bodden, Stechlinsee, Oder, Elbe, and Muggelsee). The investigations showed that an average Cs137 accumulation factor of 1000 should be applied when evaluating the body burden of man through the ecological chain water-fish-man and the receiving capacity of surface water for Cs137. On the basis of experimentally determined accumulation factors, it was concluded that further use of contaminated cooling waters for fish production is possible. (See also W77-10384) (Chilton-ORNL)
W77-10416

RELEASE PATHWAYS FOR DEEP SEABED DISPOSAL OF RADIOACTIVE WASTES,
Sandia Labs-1, Albuquerque, N. Mex.
D. R. Anderson, W. P. Bishop, V. T. Bowen, J. P. Brannen, and W. N. Caudle.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 483-504, 9 fig, 2 tab, 10 ref. IAEA-SM-198/34.

Descriptors: *Water pollution, *Radioactive wastes disposal, Path of pollutant, Oceans, Bottom sediments, *Radioisotopes.
Identifiers: Seabed disposal, Basement rock.

Mid-plate/mid-gyre regions of the oceans are identified as areas for possible disposal of radioactive wastes. Possible dispersion of radioisotopes through a set of barriers (by cask corrosion, leaching, upward transport with upward moving pore water, biological transport, slow throughput of currents, advection and diffusion through the water column, thermally driven transport) is discussed. A mathematical model of the barriers has been prepared and one part of the model, which confirms estimates of the length of time for movement of the nuclides through the sediment column (more than a million years) has been tried. To date no serious technical reasons have been found to doubt the possibility of successful seabed disposal of high-level nuclear wastes. (See also W77-10384) (Chilton-ORNL)
W77-10417

OFFSHORE MINERAL RESOURCE EXPLOITATION: THE STATE AND FEDERAL RESPONSE,
For primary bibliographic entry see Field 6E.
W77-10471

LIVING WITH THE LAKE. A GUIDE TO ILLINOIS LAKESHORE MANAGEMENT.
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 5G.
W77-10504

GROUNDWATER MONITORING WELLS,
Stearns and Wheeler, Cazenovia, N. Y.
A. F. Diefendorf, and R. Ausburn.
Public Works, Vol. 108, No. 7, p 48-51, July, 1977. 2 fig.

Descriptors: *Observation wells, *Monitoring, *Waste disposal, *Groundwater movement, Landfills, Leaching, Water pollution sources, Sampling, Well screens.
Identifiers: Cluster wells.

Current environmental regulations in many cases require ground water monitoring of areas near waste disposal projects. Proper layout and design of observation wells are absolutely essential to insure reliability of the water samples taken. Detailed site investigations involving a variety of geologic and geophysical methods are a necessary first step in determining a proposed well field's characteristics; placement of individual wells or well clusters should be tailored to adequately intercept the expected paths of contaminants as predicted by the preliminary surveys. Well construction must be undertaken with the possible effects of the installation process itself in mind. Certain types of well screens and casings, for example, can react with high strength or corrosive contaminants and cause sampling anomalies. Migration of fines or sediment entering the well due to faulty construction could also result in erroneous analyses. Observation well projects are best accomplished by drillers who are familiar with monitoring well procedures. High-quality sampling can only be carried out by personnel who have been trained to use approved procedures for obtaining and handling samples. (Eberle-NWWA)
W77-10517

ENVIRONMENTAL IMPACTS OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., Oreg.
For primary bibliographic entry see Field 5D.
W77-10536

HANDBOOK FOR SAMPLING AND SAMPLE PRESERVATION OF WATER AND WASTEWATER,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5A.
W77-10539

AUTOMATIC NETWORK ANALYSIS BY MICROCOMPUTER.
Water and Sewage Works, Vol 120, No 3, p 65, March, 1973.

Descriptors: *Computers, *Analytical techniques, Pipes, Flow, Public utilities, Water supply, Costs.
Identifiers: Network analysis system, Flow distribution, Microcomputer, Flow distribution balancing.

The Olivetti P 602/MLU Network Analysis System, a self-contained printing computer capable of storing both numerical data and programs, is currently solving problems for the Bureau of Environmental Engineering in Arkansas. Application for this computer is found in determining correct flow and head loss for pipes in a water network by performing the Hardy-Cross flow distribution balancing process. The system permits municipal water departments to evaluate the adequacy of a public water system prior to its construction and locate deficiencies in pipe networks which are already constructed. The balancing process of the flow distribution is completely automatic. The P 602/MLU system processes all data unattended. Upon convergence of the process to a pre-determined constant, the corrected flow and head loss are printed for every pipe in every loop. The balancing process will continue automatically without the need to re-enter any data. The network analysis system costs $6675 or it can be leased for less than $160 per month. (Sandoski-FIRL)
W77-10544

PROGRAM HOPES TO REDUCE POLLUTION FROM SEWER OVERFLOW.
Water and Wastes Engineering, Vol. 14, No. 5, p 32, May, 1977.

Descriptors: *Stormflow, *Combined sewers, *Overflow, *Drainage systems, *Sewerage, Municipal wastes, Sewage disposal, Effluents, Storm drains, Storm water, Water pollution sources, Urban drainage, Urban runoff, Waste water treatment.
Identifiers: Syracuse(NY), Onondaga Lake(NY), O'Brien and Gere Engineers.

A study being conducted by the Onondaga County Department of Drainage and Sanitation was originated to develop an abatement program for overflow discharges into Onondaga Lake by the city of Syracuse, New York. An examination of quantity/quality relationships, measurements, projections, and assessment of the impact of overflows on receiving waters led to the development of a four-step plan of action. This plan includes the definition of major drainage areas, studies on selected overflow sites using automatic sampling and flow monitoring equipment, and verification of a model to be used for overflow and pollutant loading prediction. During an overflow, samplers are automatically activated by a relay system in the flow monitoring equipment and samples are taken at predetermined intervals. Following the overflow, samples are collected for laboratory analysis, as these overflow discharges may contain a heavy load of oxygen-demanding matter, suspended solids, bacteria, and viral organisms. (Schulz-FIRL)
W77-10547

THE PRESENT STATE AND PROBLEMS ON THE RED TIDE RESEARCH IN JAPAN, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
Bull Plankton Soc Jap. 19(2), p 115-124, 1973.

Descriptors: *Red tide, *Nutrients, *Phosphorus, Water pollution sources, Plant growth, Pulp wastes, Industrial wastes, *Gymnodinium, Foreign research, *Benthos, Mud.
Identifiers: *Eutreptiella-sp, Heterosigma-inlandica, *Heterosigma-sp, Prorocentrum-triestrium, *Japan.

The design of research efforts directed elucidating the cause of red tides in Japan is outlined. Organisms identified as involved, and whose growth characteristics have been studied are: Eutreptiella sp., Heterosigma inlandica, Heterosigma sp., Gymnodinium-sp. Type-65 and Prorocentrum triestinum. Nutrients from bottom mud and discharges from pulp mills have been implicated in promoting growth of these organisms. Phosphorus concentration was limiting in some studies. The best approach for completion of the study is outlined.--Copyright 1974, Biological Abstracts, Inc.
W77-10551

WATER-QUALITY DATA FOR THE EAGLE RIVER VALLEY IN THE VICINITY OF EAGLE AND VAIL, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. F. Giles, and R. E. Brogden.
Open-file report 76-812, November 1976. 1 sheet, 2 tab, 5 ref.

Descriptors: *Water quality, *Groundwater, *Streams, *Chemical analysis, *Water quality standards, Recreation facilities, Colorado, Data collections, Sampling, *Eagle River valley.

Water-quality data were collected by the U.S. Geological Survey in the Eagle River valley, Colo., during 1976. Forty-nine ground-water samples from wells and springs were collected and analyzed during the study. Eight surface-water samples were analyzed. All the water samples were analyzed for major cations and anions, selenium, and arsenic. Seven of the surface-water samples also were analyzed for trace elements. The potability of ground and surface waters in the Eagle River valley can be determined by comparing the chemical data in tables with the recommended drinking-water-quality standards of the U.S. Public Health Service (1962) presented at the top of the tables. Most of the analyses indicate that only a few chemical constituents (dissolved solids, iron, manganese, and sulfate) occur in excess of these standards. The occurrence of selenium in excess of the recommended limits was detected in two samples. (Woodard-USGS)
W77-10555

DISSOLVED SOLIDS, HARDNESS, AND ORTHOPHOSPHATE OF SURFACE-WATER RUNOFF IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
J. E. Earle.
Water Resources Investigation 76-15 (open-file report), 1976. 6 p, 3 maps, 4 ref.

Descriptors: *Surface runoff, *Hardness(Water), *Phosphates, *Dissolved solids, *Florida, Regional analysis, Water quality, Maps, Chemical analysis, *Suwannee River basin(Fla), *Orthophosphates.

Historical water-quality data collected from January 1965 to September 1970 were used to prepare maps showing the generalized distribution of dissolved solids, hardness, and orthophosphate in streams and lakes in the Suwannee River Water Management District. The regional concentration patterns shown on the maps are generalized and local variations may be expected. The dissolved-solids concentrations generally range from 15 to 300 milligrams per liter. Higher concentrations are found in the coastal area on tide affected streams. The concentrations of hardness as CaCO3 generally range from 10 to 200 milligrams per liter. The concentrations of dissolved orthophosphate generally range from 0 to 3 milligrams per liter. These maps provide information to those concerned with water resources management and establish a basis for comparing future quality data. (Woodard-USGS)
W77-10556

DISTRIBUTION OF NITRATE IN GROUND WATER, REDLANDS, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
L. A. Eccles, and W. L. Bradford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 573/AS, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-117, March 1977. 38 p, 10 fig, 4 tab, 25 ref.

Descriptors: *Water pollution sources, *Groundwater, *Nitrates, *Path of pollutants, *Fertilizers, California, Groundwater movement, Water wells, Water level fluctuations, Pumping, Aquifer characteristics, Urbanization, Leaching, Redlands(Calif).

Wells producing water with nitrate as nitrogen concentrations in excess of 10 milligrams per liter are common throughout the Redlands, Calif., area. Nitrite as nitrogen concentrations in water from the saturated part of the aquifer ranged from much greater than 20 milligrams per liter at the water table to less than 5 milligrams per liter at depths of 300 feet below the water table. This depth dependence suggests that the major source of nitrate is a generalized area-wide infiltration of high-nitrate water downward from the surface through the unsaturated zone. The nitrate concentration in water from individual wells is dependent primarily upon depth and well construction--particularly aquifer seal and aquifer penetration--and secondarily upon well location. Nitrate concentrations of water in wells are increased by heavy pumping which causes high-nitrate water near the water table to be pulled deeper. (Woodard-USGS)
W77-10558

WATER-QUALITY DATA FOR THE SOUTHERN UTE INDIAN RESERVATION, SOUTHWESTERN COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
E. C. Hutchinson, and R. E. Brogden.
Open-file report 76-16, December 1976. 36 p, 2 fig, 2 plates, 2 tab, 7 ref.

Descriptors: *Water quality, *Surface waters, *Groundwater, *Indian reservations, *Colorado, Data collections, Sampling, Water analysis, Chemical analysis, Anions, Cations, *Southern Ute Indian Reservation(Colo), Selenium, Arsenic.

Water-quality data from a study by the U.S. Geological Survey on the Southern Ute Indian Reservation in southwestern Colorado are presented in two tables. The data were collected during 1973-76 from 338 ground-water and surface-water samples. All samples were analyzed for major catons and anions, and selenium and arsenic. Data in the tables are keyed by numbers to maps showing the locations of sampling sites. Many of the samples contained arsenic, chloride, dissolved solids, fluoride, iron, magnesium, manganese, nitrate, nitrite-plus-nitrate as nitrogen, selenium, and sulfate in concentrations exceeding recommended or mandatory standards for drinking water established by the Colorado Department of Health and U.S. Public Health Service. (Woodard-USGS)
W77-10562

ELECTROBIOCHEMICAL NEUTRALIZATION OF ACID MINE WATER,
Geological Survey, Reston, Va.: Geologic Div.; and Geological Survey, Reston, Va. Conservation Div.
F. D. Sisler, F. E. Senftle, and J. Skinner.
Journal of the Water Pollution Control Federation, Vol 49, No 3, p 369-374, March 1977. 3 fig, 16 ref.

Descriptors: *Water pollution control, *Mine acids, *Electrophoresis, *Analytical techniques, Electrodes, Hydrogen ion concentration, Chemical properties, Water chemistry, Electrochemistry, *Acid mine water.

When iron sulfides in a coal mine are exposed to water containing oxygen and sulfur-oxidizing bacteria, oxidation takes place, which results in the formation of sulfuric acid. The acid mine water formed constitutes a formidable water pollution problem that seriously affects thousands of kilometers of streams and surface acreage in the U.S. In 1972, more than 3.5 billion kilograms (4 million tons) per year of sulfur acids were estimated to have drained from active and abandoned coal mines. The additional strip mining for coal brought about by the energy crisis could result in even more serious pollution problems. In this paper the basic water-treatment technique of Decker and King (1973) is combined with the biochemical fuel-cell principle. By adding electrodes and a simple external circuit to the system, one can increase the rate of acid neutralization. In addition, it may be possible to obtain a modest amount of electric power for plant operation, a practical means of disposal of sludge, and the recovery of some free sulfur. (Woodard-USGS)
W77-10569

NUMERICAL MODELING OF SUBSURFACE RADIOACTIVE SOLUTE TRANSPORT FROM WASTE-SEEPAGE PONDS AT THE IDAHO NATIONAL ENGINEERING LABORATORY,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. B. Robertson.
Available from the National Technical Information Service, Springfield, VA 22161 as IDO-22057, Price codes: A05 in paper copy, A01 in microfiche. Open-file report 76-717, January 1977. 68 p, 23 fig, 3 tab, 35 ref.

Descriptors: *Model studies, *Groundwater movement, *Path of pollutants, *Radioactive wastes, *Numerical analysis, Seepage, Ponds, Waste disposal, Analytical techniques, Snake River.

Aqueous chemical and low-level radioactive effluents have been disposed to seepage ponds since 1952 at the Idaho National Engineering Laboratory. The solutions percolate toward the Snake River Plain aquifer (135 m below) through interlayered basalts and unconsolidated sediments and an extensive zone of ground water perched on a sedimentary layer about 40 m beneath the ponds. A three-segment numerical model was developed to simulate the system, including effects of convection, hydrodynamic dispersion, radioactive decay, and adsorption. Simulated hydraulics and solute migration patterns for all segments agree adequately with the available field data. The model can be used to project subsurface distributions of waste solutes under a variety of assumed conditions for the future. Although chloride and tritium reached the aquifer several years ago, the model analysis suggests that the more easily sorbed solutes, such as cesium-137 and strontium-90, would not reach the aquifer in detectable concentrations within 150 years for the conditions assumed. (Woodard-USGS)
W77-10570

PRELIMINARY REPORT ON THE QUALITY OF WATER IN ABANDONED ZINC MINES IN

NORTHEASTERN OKLAHOMA AND SOUTHEASTERN KANSAS,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
S. J. Playton, and R. E. Davis.
Open-file report 77-163, March 1977. 36 p, 4 fig, 15 tab, 3 ref.

Descriptors: *Water quality, *Mine water, *Zinc, *Underground storage, *Chemical analysis, Oklahoma, Hydrogen ion concentration, Specific conductivity, Dissolved solids, Heavy metals, Water temperature, Chemical stratification, Water chemistry, *Acid mine water.

On-site measurements of pH, specific conductance, and water temperature show that water in seven mine shafts in northeastern Oklahoma and southwestern Kansas is stratified, with pH decreasing and specific conductance and water temperature increasing as sampling depth increases. Concentrations of chemical constitutents in mine-shaft water, such as dissolved solids, total and dissolved metals, and dissolved sulfate also increase as sampling depth increases. (Woodard-USGS)
W77-10571

SOLVING STREAM POLLUTION CONTROL PROBLEMS WITH DIGITAL COMPUTER AND MODELLING TECHNIQUES,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, M. H. Wang, and J. F. Bergenthal.
Proceedings of the Institute of Environmental Sciences, 23rd Annual Technical Meeting, April 25-27, 1977, Los Angeles, California, p 29-31. 1 fig, 1 tab, 7 ref.

Descriptors: *Dissolved oxygen, *Biochemical oxygen demand, *Mathematical models, Water pollution control, Temperature, Streamflow, Loads(Forces), Model studies, Computers, Waste water treatment, Analytical techniques.
Identifiers: DO-drop.

Procedures were described for modelling and controlling stream pollution. A mathematical model was developed by means of the multiple linear correlation method. This model calculated dissolved oxygen (DO) concentrations in fresh water at various temperatures. The DO-drop was determined to be a function of combined BOD loads of upstream, the temperature of stream water, and the stream flow. The model was used to calculate allowable BOD discharges in the upstream. A different DO-drop model should be developed for different streams or different sections in the same stream. (Collins-FIRL)
W77-10596

URBAN RUNOFF AND COMBINED SEWER OVERFLOW,
Environmental Protection Agency, Edison, N.J. Wastewater Research Div.
For primary bibliographic entry see Field 4A.
W77-10600

CLEANSING THE RIVER TYNE,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 5D.
W77-10613

DISTRIBUTION OF GAS FORMING BACTERIA IN SULFUR DEPOSITS OF THE PRECARPATHIANS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Biochemistry and Physiology of Microorganisms.
S. S. Belyaev, and M. V. Ivanov.
Prikl Biokhim Mikrobiol. 9(1), p 67-72, 1973.

Descriptors: *Distribution, *Bacteria, Pollutant identification, *Sulfur, Gases, Microorganisms, Water pollution sources.
Identifiers: *Poland(Precarpathians), *Ukraine(Precarpathians), *Dissolved gases, Gas-forming bacteria.

Analysis of the gas dissolved in H2S-containing underground waters of sulfur deposits in the Ukraine and Poland showed that the main components were methane, N2 and CO2 with levels varying over a wide range. Study of the occurrence of microorganisms in underground water samples and the qualitative composition of the gas formed during the development of anaerobes suggests that these gases are formed as a result of recent microbiological processes.--Copyright 1974, Biological Abstracts, Inc.
W77-10640

RECOVERY AND SUSCEPTIBILITY PATTERN OF FAECAL STREPTOCOCCI BACTERIOPHAGES,
National Research Centre, Cairo (Egypt). Water Pollution Dept.
For primary bibliographic entry see Field 5A.
W77-10641

ORGANIC COMPOUNDS IN RED PINE KRAFT BLEACHING SPENT LIQUOR (IN JAPANESE),
Government Forest Experiment Station, Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W77-10699

STUDY OF DILUTION OF SULFITE MILL EFFLUENTS IN LARGE RIVERS AND EVALUATION OF DETERMINING FACTORS (ISSLEDOVANIE PROTSESSA RAZBAVLENIYA STOKOV SUL'FIT-TSELLYULOZNOGO PROIZVODSTVA V USLOVIAKH BOLSHIKH REK I OTSENKA OPREDELYASHCHIKH FAKTOROV),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
A. I. Shishkin, T. N. Yurovskaya, B. I. Gurbashkov, and Z. M. Gulyakova.
Materialy Vsesoyuznogo Nauchnogo Simpoziuma po Sovremennym Problemam Samoochishcheniya Regulirovaniya Kachestva Vody, 5th, No. 1, p 183-189, 1975. 6 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste dilution, Rivers, Wastes, *Industrial wastes, *Water pollution sources, Pulp and paper industry, Water quality, Lignins, Sulfates, Chlorides, Color, Discharge(Water), Diffusion, Mathematical models, Self-purification, Water pollution, *Path of pollutants.
Identifiers: Lignosulfonic acids.

A hydro chemical study of a large river receiving sulfite mill effluents allowed evaluating the water quality before and after the discharge during the summer-fall period. The contents of lignosulfonic acids, sulfates, and chlorides, and the water color served as quality critiera. The data were used to obtain distribution diagrams of pollutants in the vertical and horizontal directions and the extent of effluent dilution at various distances from the point of discharge. In a large river, where the ratio of effluent to river water is about 1:600, complete mixing took place at a distance of 250-300 m from the discharge point. A mathematical model was developed for the determination of the optimum conditions of effluent discharge, based on a three-directional diffusion equation and experimental determination of the equation parameters. The self-purification of the river can be determined from calculated dilution of the effluent and the mathematical mode for given values of the diffusion coefficients. (Stapinski-IPC)
W77-10704

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
M. Iacoboni, and R. O. Blosser.
NCASI Special Report No. 76-03, March, 1976. 9 p, 1 tab.

Descriptors: *Dissolved oxygen, *Water pollution effects, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Water quality, Effluents, Monitoring.

An analysis was made of dissolved oxygen data for 77 monitoring stations below 80 pulp and paper mills during the low-flow months in the years 1954, 1964, 1969, and 1974. There was a significant increase in dissolved oxygen levels between 1969 and 1974. In 82% of the cases the dissolved oxygen met or exceeded the water quality standards in 1974. In the cases where the levels were significantly less than the standard, the mill effluent comprised all of the bulk of the stream flow. (Buchanan-IPC)
W77-10705

USE OF LABORATORY EXTRACTION DATA TO PREDICT LOSSES OF DISSOLVED INORGANIC PHOSPHATE IN SURFACE RUNOFF AND TILE DRAINAGE,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W77-10734

CONTAMINATION OF DRINKING WATER BY CORROSION OF COPPER TUBES,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
G. G. Page.
N Z J Sci. 16(2), p 349-388, 1973.

Descriptors: *Potable water, *Corrosion, Copper, Water pollution, Pipes, Tubes.
Identifiers: *New Zealand, *Copper corrosion(Pipes).

Cu pipe normally gives excellent service in New Zealand and does not cause significant contamination of potable waters. However, under unfavorable conditions, the water drawn from taps in Auckland and some other New Zealand towns is persistently contaminated with suspended blue or green Cu corrosion products. These waters are very soft and unbuffered, and are treated by conventional techniques of alum flocculation and rapid sand filtration, with post-filtration pH adjustment, chlorination and fluoridation. Services showing this contamination are subject to excessive surface erosion due to velocity or turbulence. Coloration complaints also occur during the commissioning of buildings and from little-used small-bore branch services. In these cases the retention time of the water in the Cu services is excessive, Cu contamination builds up, and when used the water is liable to be colored. The level of contamination may be high when the corrosion rate is significant, the surface/volume ratio is high, or the flow rates low (or nil). In other instances, the corrosion deposits that form adhere to the bores of the Cu tubes and resist the scour that occurs when the service is in normal use. However, they may be displaced when unusual conditions prevail (e.g. increased velocities, water hammer, draining of the service). The volumes of contaminated water that can be purged from the systems are related to the amounts of water retained in the service, and the conditions that cause the dislodgement of the corrosion products. Other factors which influence the occurrence of Cu contamination in water drawn from small-bore Cu services include those that influence the stability of the adhesion of the corrosion products (including variations in the pH of the incoming water) and galvanic effects, including the relative anode area. (See also W75-06111). Copyright 1974, Biological Abstracts, Inc.

W77-10735

TOXICITY OF ALKYLDINITROPHENOLS TO SOME AQUATIC ORGANISMS,
Fisheries and Marine Service, St. Andrews (New Brunswick).
For primary bibliographic entry see Field 5C.
W77-10738

CONVERSION OF 1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE (DDT) TO WATER-SOLUBLE PRODUCTS BY MICROORGANISMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
For primary bibliographic entry see Field 5C.
W77-10742

INFLUENCE OF SEDIMENT INFLOW IN PHYTOPLANKTON PRIMARY PRODUCTIVITY IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10743

SURVEY OF INDUSTRIAL PROCESSING DATA. TASK II--POLLUTION POTENTIAL OF POLYBROMINATED BIPHENYLS,
Midwest Research Inst., Kansas City, Mo.
C. E. Mumma, and D. D. Wallace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 690, Price codes: A04 in paper copy, A01 in microfiche. Report EPA 560/3/-75-004, June 1975. 56 p. 4 fig, 5 tab, 55 ref. EPA 68-01-2105.

Descriptors: *Water pollution sources, *Toxicity, Chemical industry, Industrial production, Industrial waters, Effluents, Bromides, Phenols, Bromine, Organic compounds.
Identifiers: *Polybrominated biphenyls, Hydrocarbons.

The potential for environmental contamination by brominated biphenyls is evaluated. Included are the identification and evaluation of production sites and volumes, manufacturing processes and waste disposal practices, commercial uses and substitutes, and environmental and health aspects. It is concluded that: (1) since 1974, no domestic commercial manufacturer has produced PBBs or is likely to do so in the near future, (2) some unidentified chemical production processes not related to direct production of PBBs can generate measurable quantities of PBBs appears to be related primarily to production and formulation processes rather than to usage and disposal of products containing PBBs, (4) domestic manufacturing sites where PBBs are used as raw materials are potential pollution sources, (5) the principal uses of PBBs in the U.S. has been as a fire-retardant additive in thermoplastic products and as such does not come into contact with human food or clothing, (6) use of PBBs is being phased out by the largest domestic consumer in favor of less toxic but more expensive fire-retardant substitutes, and (7) biological studies indicate that PBBs have a low acure toxicity, can bioaccumulate in fatty tissues, and can cause adverse effects on animal organs, especially the liver. (Luedtke-Wisconsin).
W77-10750

NITROGEN UPTAKE AND RELEASE IN A FORESTED WATERSHED, LAKE TAHOE BASIN, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10753

SUMMER ZOOPLANKTON DISTRIBUTION IN A GEORGIA ESTUARY,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-10756

DRY DEPOSITION LOADING OF LAKE MICHIGAN BY AIRBORNE PARTICULARATE MATTER,
Governors State Univ., Park Forest South, Ill. College of Environmental and Applied Sciences.
For primary bibliographic entry see Field 5A.
W77-10758

COMPARISON OF BACTERIAL AND ALGAL UTILIZATION OF ORTHOPHOSPHATE IN AN ESTUARINE ENVIRONMENT,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W77-10760

INVESTIGATION OF THE HYDROLOGICAL BALANCE IN A PEAT SWAMP,
Brussels Univ. (Belgium).
For primary bibliographic entry see Field 2F.
W77-10768

LEAD DISTRIBUTION IN THE CAPE FEAR RIVER ESTUARY,
Duke Univ., Beaufort, N.C. Marine Lab. and Duke Univ., Beaufort, N.C. Dept. of Chemistry.
R. W. Baier.
Journal of Environmental Quality, Vol. 6, No. 2, p 205-210, April-June 1977. 5 fig, 3 tab, 19 ref. DES74-12831, CG00005, GD32560.

Descriptors: *North Carolina, *Lead, *Water pollution, *Estuarine environment, *Fluvial sediments, *Pollutants, Analytical techniques, Heavy metals, Gasoline, Toxicity, Estuaries, Streams, Tides, Sediment transport, Flumes, Chemical analysis, Bottom sediments.
Identifiers: *Lead distribution, *Cape Fear River Estuary(NC), *Lead complexes, *Estuarine transport, *Lead pollution, Anodic stripping voltammetry, Protolysis, Trace metals, Antiknock compounds, Atomic absorption spectrophotometry, Polarographic analyzer, Complex formation.

Water and mud samples collected during 1973 and 1974 from the Cape Fear River, the region of its plume, and adjacent slope waters were analyzed for lead (Pb) by anodic stripping voltammetry and atomic absorption spectroscopy. Partitioning among adsorbed, strongly conplexed, and electroactive states of Pb in seawater was estimated by filtration and voltammetric analyses at two pH levels. A significant fraction of the Pb present was found to be compelexed in river water, but was dissociated upon mixing with shelf water. The concentration of Pb in offshore sediment with increasing grain size. All concentrations of Pb found in the Cape Fear River estuary wee well below recognized lethal values for aquatic life. (Henley-ISWS)
W77-10772

EFFECTS OF INCREASED FERTILIZER RATES ON NITROGEN CONTENT OF RUNOFF AND PERCOLATE FROM MONOLITH LYSIMETERS,
Agricultural Research Service, Temple, Tex.
For primary bibliographic entry see Field 5G.
W77-10773

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
P. Todorovic, D. B. Simons, and R. M. Li.
In: Stochastic Approaches to Water Resources, Volume II, Chapter 27, Colorado State University, Fort Collins, p 27-1 - 27-17, 1976. 6 fig, 2 tab, 5 ref.

Descriptors: *Dispersion, *Open channel flow, *Model studies, *Stochastic processes, Mathematical models, Mathematical studies, Transfer, Statistical methods, Probability, Flow, Turbulent flow, Uniform flow, Theoretical analysis, Particles, Movement, Analytical techniques, Laboratory tests, Tracers, Path of pollutants.

A mathematical model of longitudinal dispersion for the case of stationary and homogeneous turbulence in steady fluid flow was derived using two approaches. One method was stochastic, based upon stochastic process of nondecreasing sample functions, and a one-dimensional probability distribution represented the longitudinal concentration function of the dispersant in the flow. The other approach was deterministic, involving the use of the principle of conservation of mass to derive a partial differential equation, the solution to which, under appropriate boundary conditions, gives the identical concentration function obtained using the probabilistic approach. To verify the developed theory, dispersion experiments were conducted in a two-ft wide circulating flume. Rodamin WT dye was injected into the flow from an instantaneous plane source for two different, but steady, flow conditions. The theoretical analysis showed that the mode of probability density function of the travel time of tagged particles is asymptotically a linear function of the distance, x. The theoretical result was verified by the experimental data. It was found that the two termed theoretical probability density functions compared favorably with the observed experimental results. (See also W77-10439) (Humphreys-ISWS)
W77-10794

DISPERSION OF SEDIMENT PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10795

DETERMINATION OF INORGANIC PHOSPHORUS IN OXALATE EXTRACTS OF SOILS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W77-10797

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
M. G. Rodel, D. E. Armstrong, and R. F. Harris.
Limnology and Oceanography, Vol 22, No 3, p 415-422, May 1977. 3 fig, 3 tab, 16 ref. OWRT B-002 WIS(15). 14-01-0001-1969.

Descriptors: *Sorption, *Hydrolysis, *Organic compounds, *Phosphorus compounds, Lakes, *Lake sediments, Laboratory tests, Phosphorus, Nutrients, Chemicals, Chemical reactions, Sediments, Microorganisms, Biology, Biological communities, Biological properties, Limnology.

The sorption and hydrolysis of three types of organic phosphate compounds in a lake sediment-water system were investigated. An intact, nonsterilized sediment was used to allow evaluation of chemical and biological effects. Sorption was attributed mainly to chemical interactions and hydrolysis to sediment microorganisms. The extent of sorption varied with the type of compound and was partly related to the number of phosphate groups per molecule. Hydrolysis rates were decreased by organic P sorption and by incubation at 4C rather than at room temperature. (Sims-ISWS)
W77-10799

Group 5C—Effects of Pollution

RELATIONSHIP BETWEEN NITROGEN FIXATION (ACETYLENE REDUCTION) AND THE C:N RATIO IN A POLLUTED CORAL REEF. ECOSYSTEM, KANEOHE BAY, HAWAII,
Hawaii Univ., Honolulu. Dept. of Microbiology.
R. B. Hanson, and K. Gundersen.
Estuarine and Coastal Marine Science, Vol 5, No. 3, p 437-444, May 1977. 5 fig, 33 ref.

Descriptors: *Nitrogen fixation, *Algae, *Nitrogen fixing bacteria, *Hawaii, Bays, Water pollution, Nutrients, Sewage effluents, Sediments, Coral, Sampling, On-site investigations, On-site data collections, Carbon, Nitrogen, Path of pollutants.
Identifiers: *Kaneohe Bay(Hawaii).

Biological nitrogen fixation was investigated in Kaneohe Bay, Oahu, Hawaii, which receives secondary sewage from two treatment plants. In an attempt to determine the controlling environmental factors of nitrogen fixation in the Bay, dead coral heads, sediments, and suspended matter were analyzed for carbon and nitrogen and their concentrations related to nitrogen fixation. The high blue-green algal fixation on dead coral structures in the middle sector is ascribed in part to the efficient flushing by oceanic water as indicated by the relatively high C:N ratio (15:1) of the suspended matter. It is calculated that 760 and 6 Kg N2/ha is fixed annually by blue-green algae on dead coral and bacteria in the sediment, respectively, in Kaneohe Bay. These rates would supply 2.3% of the annual nitrogen requirement for phytoplankton growth. (Sims-ISWS)
W77-10124

SOME EFFECTS OF AGRICULTURAL DEVELOPMENT AND FLUCTUATIONS IN WATER LEVEL ON THE PHYTOPLANKTON PRODUCTIVITY AND ZOOPLANKTON OF A NEW ZEALAND RESERVOIR,
Otago Univ., Dunedin (New Zealand). Dept. of Zoology.
S. F. Mitchell.
Freshwater Biology, Vol. 5, No. 6, p. 547-562, 1975. 10 fig., 4 tab., 42 ref.

Descriptors: *Primary productivity, *Reservoirs, *Water level fluctuations, *Agricultural runoff, *Eutrophication, Zooplankton, Foreign countries, Phosphates, Phytoplankton, Lakes.
Identifiers: *Lake Mahinerangi(New Zealand).

The comparative influences of higher water levels and agricultural development in the periphery of Lake Mahinerangi, a New Zealand reservoir, on phytoplankton productivity and the zooplankton communities are discussed. An increase in primary productivity to an annual average of 210 mg C/sq m per day in 1968-1970 from 76 mg C/sq m per day in 1964-66 is attributed partly to higher water levels. Introduction of agriculture to about 3% of the reservoir drainage basin also contributed to productivity, with influent streams from the agricultural areas contributing more than 60% of the reactive phosphate while representing only 24% of the water which enters the lake. Inorganic nitrogen compounds are very low in the reservoir but the agricultural development may also have increased nitrate income. Bicarbonate alkalinity was slightly higher than in the earlier investigation, with a concurrent increase in pH, possibly due to lime leached from agricultural land. Secchi disc transparency also increase, in contrast to the usual symptoms of increased productivity. None of the three dominant Zooplankton species increased but there were substantial increases in two less abundant taxa, Daphnia carinata and Cyclopoida. The various factors involved in the biological responses due to the elevated water levels and nutrient inputs are evaluated. (Auen-Wisconsin).
W77-10137

VARIATION IN CHEMICAL COMPOSITION OF THE RIVER FROME, ENGLAND, FROM 1965 TO 1972,
Freshwater Biological Association, East Stoke (England).
H. Casey.
Freshwater Biology, Vol. 5, No. 6, p 507-514, 1975. 6 tab., 21 ref.

Descriptors: *Rivers, *Nutrients, *River flow, *Variability, Runoff, Foreign countries, Nitrates, Phosphates, Chemical properties, Water chemistry, Potassium, Agricultural runoff, Sewage effluents, Drainage basins.
Identifiers: *River Frome(England), *Nutrient sources, Chalk streams.

Amounts and chemical nutrients, their variations in relation to river flow and their sources were calculated in a 1965-1972 study of the River Frome, England. Mean flow ranged between 4.48 cu m/sec to 8.38 during the study period. Alkalinity, calcium, sodium and potassium values were almost constant. Silica showed large annual variations but the chalk springs, which are the major water source to the river, also showed large variations. Nitrate concentrations had increased from a mean value of 2.05 mg/l in 1965 to 3.06 in 1972. Most of this increase was due to the increasing use of nitrogen fertilizers. The percentage of nitrate derived from sewage effluents was fairly constant in around 7%. Phosphate concentrations had increased from 108 microgram/l in 1965 to 134.7 in 1972, over 70% of which are attributed to sewage effluents. Sewage effluents increased by 29% from 1965 to 1972 and are calculated to increase by 14% by 1980. The 1972 input, in tons, of phosphorus from sewage was 17.6; for 1980 the input would be 33.6 tons. When divided by the mean 1972 river flow the result would be 186 microgram/l phosphorus entirely due to sewage. The increase in sewage would also rise the nitrate 21% over the 1972 values. (Auen-Wisconsin)
W77-10138

EFFECTS OF ARTIFICIALLY INTRODUCED GROUND WATER ON THE CHEMICAL AND BIOCHEMICAL CHARACTERISTICS OF SIX HILLSBOROUGH COUNTY (FLORIDA) LAKES,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 2H.
W77-10139

PRIMARY PRODUCTION STUDIES IN PORTO NOVO WATERS, S. INDIA,
Centre of Advanced Study in Marine Biology, Porto Novo (India).
A. Purushothaman, and G. P. Bhatnagar.
Archiv fur Hydrobiologie, Vol. 77, No. 1, p 27-50, 1976. 10 fig, 14 ref.

Descriptors: *Primary productivity, *Estuaries, *Salinity, *Light penetration, Asia, Phosphates, Nitrates, Silica, Chlorophyll.
Identifiers: Porto Novo(India), *Villar Estuary(India).

Primary productivity and its contributing factors in the Vellar estuary of Porto Novo, South India, are described. Maximum primary production occurred at the mouth of the estuary where the water was most clear. The estuary is turbid but nevertheless light penetrates to the bottom because of its shallow depth and is available to production even at the bottom. Peak production values recorded at all seven study stations coincided with the rise in temperature and salinity in April, possible due to the influence of neritic waters and neritic phytoplankton. The N:P ratio ranged from 1:1 in April to 12:1 in February, with the minimum N:P ratio observed when production was maximum in April. Nitrates increased at the upper estuary and silicate contents were also very high. The ratio of photosynthesis to chlorophyll-a varied between 8.1 and 20.9. The carbon assimilation to chlorophyll-a ratio also varied. Chlorophyll-a and net photosynthesis correlated highly and were uniformly high in all stations. Production increased gradually beginning with the post-monsoon season and attained a peak value in April, when the temperature, salinity and light were high and the estuary was inundated by neritic water. However, nutrient levels dropped, possibly due to utilization by algae. (Auen-Wisconsin)
W77-10140

LIMNOLOGICAL STUDIES IN A LARGE, DEEP, OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA). EVALUATION OF NUTRIENT AVAILABILITY AND CONTROL OF PHYTOPLANKTON PRODUCTION THROUGH IN SITU RADIOBIOASSAY PROCEDURES,
Dartmouth Coll., Hanover, N.H. Dept. of Biological Sciences.
H. L. Allen, and B. T. Ocevski.
Archiv fur Hydrobiologie, Vol. 77, No. 1, p 1-21, 1976. 1 fig, 8 tab, 20 ref. SFG-2-8264.

Descriptors: *Primary productivity, *Limiting factors, *Oligotrophy, *Hardness(Water), Inorganic compounds, Foreign countries, Organic compounds, Silica, Iron, Nitrilotriacetic acid, Chelation, Trace elements, Vitamins, Marl, Lakes.
Identifiers: *Lake Ohrid(Yugoslavia).

Control of pelagial phytoplankton photosynthetic productivity rates by actual and physiological availability of inorganic and organic nutrients was investigated in Lake Ohrid, Yugoslavia, by carbon-14 bioassays. Results indicated that phytoplankton populations from 10-20 m depths were significantly limited by the availability of various inorganic nutrients. Phytoplankton populations, predominately centric diatonms, at depths near the light--compensation point and in upper hypolimnetic waters during summer stratification, were significantly limited during much of spring and early summer. There were frequently additives as well as synergistic stimulatory responses of productivity induced by addition of 1-40 microgram/l silica, iron and phosphate, when added or simultaneously. Nitrate failed to produce any persistent stimulation. Simultaneous additions of iron and NTA frequently resulted in synergistic stimulation. Glucose, acetate, glycine and NTA produced marked stimulatory responses. Chelated trace elements added separately or mixed inhibited phytoplankton production. Vitamins failed to stimulate productivity, with the exception of marked stimulation by microadditions of B12. The low productivity of this lake is attributed to thermal stratification characteristics, including thermal optima required for maximum growth; light penetration characteristics and the qualitative nature of the light at depth; availability of organic compounds that function as chelating or complexing agents, and availability of inorganic iron, silica, phosphorus, and possibly vitamins. (Auen-Wisconsin)
W77-10141

CHEMICAL INPUTS BY A COLONY OF FRANKLIN'S GULLS NESTING IN CATTAILS,
Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
J. G. McColl, and J. Burger.
American Midland Naturalist, Vol. 96, No. 2, p 270-280, 1976. 2 fig, 4 tab, 21 ref.

Descriptors: *Eutrophication, *Migratory birds, *Freshwater marshes, *Cattails, *Minnesota, Gulls, Nitrogen, Phosphorus, Bottom sediments, Nesting, Calcium, Magnesium, Potassium, Sodium, Conductivity, Electrolytes.
Identifiers: Agassiz National Wildlife Refuge(Minn), Franklin's gulls, Nutrient sinks.

To study the effects of nesting by a colony of Franklin's gulls in the freshwater marsh of the Agassiz National Wildlife refuge in northern Min-

nesota, comparisons were made of water and sediment samples from two shallow pools in the marsh; one pool was colonized by about 30,000 gulls nesting among the cattails and the other pool contained cattails but no gull colony. The migratory birds arrive in late April and leave in mid-July, the young are fed entirely in the nesting colony for 35 days post-hatching, defecate within the colony, and a large number of young, and some adults, die and sink into the water. Nitrogen and phosphorus concentrations greatly increased in the water in the immediate vicinity of the gull colony; peak concentrations coincided with the peak of gull nest-building and feeding (mid-May to mid-July). About 36% of the annual phosphorus input is attributable to the gulls within the nesting area pool. However, there were no net changes in nitrogen and phosphorus concentrations in the water due to nutrient absorption by the pool sediments. The gull colony had little effect on the concentrations of sodium, potassium, calcium and magnesium in the water. Outlet waters of both the test and control pools had higher potassium concentrations than inputs due to release of potassium by the sediment to water, or by nutrient uptake and subsequent leaching from the cattails. The marsh also acts as a 'sink' for nutrients from the surrounding agricultural land. (Auen-Wisconsin)
W77-10142

EFFECT OF HERBICIDES ON PHOTOSYNTHETIC ELECTRON TRANSPORT AND ON THE GROWTH OF THE ALGA SCENEDESMUS QUADRICAUDA,
Wroclaw Univ. (Poland). Inst. of Botany and Biochemistry.
W. Hendrich, Z. Kubiak, K. Jurajda, and M. Pawlaczyk-Szpilowa.
Acta Societatis Botanicorum Poloniae, Vol. 45, No. 1, p 101-110, 1976. 4 tab, 22 ref.

Descriptors: *Herbicides, *Mode of action, *Algae, Growth rates, Photosynthesis, Scenedesmus, 2,4-D, Water pollution effects.
Identifiers: *Hill reaction, Gramoxone, Afalon, Kresamone, Simazine, CIPC.

The growth-inhibiting effects of 2,4-D, Afalon, CIPC (isopropyl ester of 3-chlorocarbanilic acid), Gramoxone-paraquat, Afalon, Kresamone and Simazine on algae and on photosynthesis was investigated with Scenedesmus quadricauda. Fourteen days of testing showed that Afalon is the most strongly toxic of these herbicides and that it reduces dry weight cell number as well as packed cell volume. The inhibitory action of Kresamone and CIPC is weak and 2,4-D, particularly in lower concentrations, has a stimulating effect on algal growth. While Afalon does not cause any deformation, Simazine, CIPC and Gramoxone induce numerous deformed cells. Kresamone and CIPC prompt the formation of swollen and light cells, frequently lacking cytoplasm, whereas Simazine favors development of large, round, well filled, and heavy cells; Gramoxone induces very small cells. Afalon inhibits growth 50% at a concentration of 0.000,001 M, an indication that the only site of its action is the chain of electron transport in the vicinity of Photosystem II. Simazine inhibits growth and the Hill reaction in isolated chloroplasts, with 50% inhibition at a concentration of about 0.000,006 M. This herbicide also causes marked morphological changes, indicating some side effects on the metabolism and cell division processes. The effect of CIPC, Kresamone and 2,4-D is not connected with electron transport in the Photosystem II. Only CIPC slightly inhibits the Hill reaction, whereas both CIPC and 2,4-D enhance cell production. (Auen-Wisconsin)
W77-10143

TRANSFER TO FISH OF PETROLEUM PARAFFINS AND ORGANIC SULFUR COMPOUNDS,
Okayama Univ. (Japan). Dept. of Public Hygiene.
M. Ogata, Y. Miyake, S. Kira, K. Matsunaga, and M. Imanaka.
Water Research, Vol. 11, No. 4, p 333-338, 1977. 4 fig, 1 tab, 12 ref.

Descriptors: *Oil pollution, *Marine fish, *Absorption, Eels, Aromatic compounds, Sulfur compounds, Laboratory tests, Foreign research, Odor, Bioindicators, Oily water, Oil spills.
Identifiers: *Bioaccumulation, Hydrocarbons, Petroleum paraffins, Arabian Light Crude oil.

In a study of the uptake of petroleum products by fish, laboratory tests followed by gas chromatography demonstrated absorption of paraffins, organic sulfur compounds and hydrocarbons by eels after exposure to Arabian Light Crude oil. Analysis of eel flesh indicated straight and branched chain paraffins in the C13, C14 and C15 groups but no chromatographic peaks indicating n-alkanes. Paraffin C13-C15 groups increased with duration of rearing time in eel flesh. The results indicated that organic sulfur compounds having relatively low boiling points in oil-contaminated water can transfer to eel flesh and will increase with length of exposure. Aromatic hydrocarbons were also present in oil treated eels, the concentration ratios descending in the order of toluene m-oip-xylene, o-xylene and benzene. An obnoxious odor was detected in eels exposed to petroleum for 1, 3, 7 and 15 days. This experiment demonstrated that crude oil organic sulfur compounds transfer from water to fish and therefore organic sulfur compounds in fish may be used as an indicator of oil pollution. (Auen-Wisconsin)
W77-10144

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF WATERS IN AN INDUSTRIALIZED ESTUARY,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and G. M. Foster.
Water Research, Vol. 11, No. 4, p 351-354, 1977. 5 fig, 2 tab, 9 ref.

Descriptors: *Ultraviolet radiation, *Absorption, *Organic loading, *Estuaries, Foreign countries, *Industrial wastes, Organic wastes.
Identifiers: *Milford Haven estuary(Wales).

The impact of industrial organic loading on the ultraviolet (uv) absorption spectra in the Milford Haven estuary, Wales, (United Kingdom) is detailed. The magnitude of integrated absorption between 250 and 350 nm varied from 1767 units at low water in the Daugleddau to 268 units in deep waters at the estuary mouth. At all tidal stages a general trend of decreasing UV absorption was clearly evident downstream demonstrating that the major source of dissolved UV absorbing organic material to the estuary originated from the river and the distribution pattern of UV absorption was predominantly dependent upon the efficiency of physical mixing between the source and sea water with low absorption entering the mouth of the estuary. The relative contributions from industrial and/or biological sources to the total organic material present progressively increased to the center of the estuary; however, the increasing contribution of low absorbing sea water downstream more than compensated for this, with the net result that the magnitude of the UV absorption and hence organic concentrations decreased seawards. The conclusion is that the impact of industrial organic loadings on the UV absorbing organic matter has been minimal and has less significance than the in situ biological activity. (Auen-Wisconsin)
W77-10145

THE INFLUENCE OF SALINITY ON THE GROWTH OF SOME PLANKTON DIATOMS FROM BRACKISH WATER,
Oslo Univ. (Norway). Section of Marine Botany.
E. Paasche.
Norwegian Journal of Botany, Vol. 22, No. 3, 1975. p. 209-215. 4 fig, 33 ref.

Descriptors: *Diatoms, *Brackish water, *Estuarine environment, *Salinity, Plankton, Growth rates, Growth stages.
Identifiers: *Stenohalinity, Thalassiosira baltical (Grunow) Ostenfeld, Microsiphona potamos Weber, Skeletonema subsalsum (A. Cleve) Bethge, S. costatum (Greville) Cleve.

In experimental work conducted to verify the stenohaline character of plankton diatoms indigenous to brackish waters, it was shown by means of culture experiments that the plankton diatoms Thalassiorsira baltica (Grunow) Ostenfeld and Skeletonema subsalsum (A. Cleve) Bethge grow best in the salinity range of 2-20 percent. The results are in agreement with the known preference of these diatoms for brackish waters in nature. Similar results were obtained with Microsiphona potamos Wever, a diatom occurring in river plankton. Two clones of the marine plankton species Skecostatum (Greville) Cleve, one from the Oslofjord and the other from the Baltic Sea, grew well at salinities between 8-40 percent; both failed to grow at a salinity of 2 percent or less. The experiments confirm that the natural distribution of brackish-water diatoms is largely governed by a physiological intolerance to high and low salt concentrations in the growth mediums. Since other studies have shown that the influence of salinity on diatom growth is not greatly modified by variations in other environmental factors, such as temperature and light, it is concluded that the salinity tolerance patterns that can be inferred from the distribution of phytoplankton species in nature generally agree with the results obtained in growth experiments. (Harris-Wisconsin)
W77-10146

THE EFFECT OF ENVIRONMENTAL FACTORS ON ESTIMATED VIABLE AND TOTAL POPULATIONS OF PLANKTONIC BACTERIA IN LAKES AND EXPERIMENTAL ENCLOSURES,
Freshwater Biological Association, Windermere (England).
J. G. Jones.
Freshwater Biology, Vol. 7, No. 1, February 1977, p 67-91. 5 fig, 9 tab, 39 ref, 1 append.

Descriptors: *Statistical methods, *Estimating, *Bacteria, *Plankton, *Lakes, Temperature, Dissolved oxygen, Chlorophyll, Ammonia, Phosphates, Eutrophication, Regression analysis, Water pollution effects.
Identifiers: *Total bacteria counts, *Viable bacteria counts, *Experimental enclosures, Multivariate analytical techniques, Principal components analysis.

Analyses of total versus viable counts of planktonic bacteria in samples taken from various depths and from two experimental enclosures in English lakes demonstrate that most of the variability in these bacterial population estimates can be explained by five of the regressor variables (temperature, dissolved oxygen, chlorophyll-a, phosphate and ammonia) and that the factors most likely to provide more information would include some measure of predation and lake retention time. The results were taken from surveys of lakes of differing degrees of enrichment and from enclosures which, unlike the lakes, and their nutrients replenished by artificial addition and not by inflowing streams. Results from weekly sampling surveys were analyzed by principal components analysis and multiple regression computer programs, multivariate techniques which allowed the generation of new sets of variables and hypotheses on the factors controlling the planktonic bacteria. These were examined in relation to future planning of sampling programs and in light of results from (1) weekly sampling programs; (2) a period of sampling at shorter intervals; and (3) horizontal and vertical spatial variations. The viable count was, on average, 0.25% of the total count. Results taken from the whole water column showed the overwhelming effect of the process of stratifiction

on the bacterial population, accounting for 30-60% of its variability. Secondary components representing algal productivity could account for 10-20% of the variability. (Harris-Wisconsin)
W77-10147

UTILIZATION OF ALGAE BY SOME COMMON FISHES OF TWO PONDS,
Christ Church Coll., Kanpur (India). Dept. of Botany.
A. G. Gypta, and D. C. Roy.
Nova Hedwigia, Vol. 26, No. 2-3, p 509-516, 1975. 1 tab, 19 ref.

Descriptors: *Fish food organisms, *Food chains, *Carp, *Fisheries, Secondary productivity, Cyanophyta, Chlorophyta, *Algae, Fish, Ponds.
Identifiers: *Kanpur(India), Bacillariophyta.

In one of a number of studies aimed at assessing the value of planktonic and other algae as direct or indirect food for fish in the inland fisheries of India, the specific feeding habits of carp and other common fish in two ponds near Kanpur were studied by examination of gut contents. The observations showed that the carps exhibited selective feeding of algae and did not utilize all the varieties present in the ponds. Chlorella vulgaris, Coelastrum sphaericum, C. cambricum, Scenedesmus quadricauda, Merismopedia tenuissima, Microsystes aeruginosa, Spirulina major and S. subsalsa were all found in large quantities in the guts of the various carp varieties. Some of the more filamentous forms of chlorophyta, cyanophyta and bacillariophyta, although present in large quantities in the ponds, were not found in the carp. However, such filamentous forms as Oedogonium amplum, O. vulgare, in addition to the S. major and S. subsalsa described earlier, were so found. The gut contents of the carp were strongly correlated with the local algae, and it is concluded that the seasonal fluctuations in the composition of the algal flora decidedly affects the food of the fishes in the pond. (Harris-Wisconsin)
W77-10148

THE INFLUENCE OF ZOOPLANKTON ANESTHETISING SUBSTANCE PHYSOSTIGMINE SALICYLICUM ON PHOTOSYNTHESIS,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
S. Wium-Andersen.
Archiv fur Hydrobiologie, Vol. 76, No. 3, November 1975, p 379-383. 1 fig, 1 tab, 11 ref.

Descriptors: *Analytical techniques, *Laboratory tests, *Photosynthesis, *Zooplankton, Digestion, Feeding rates, Grazing, Food habits, Foods.
Identifiers: *Physostigmine salicylicum.

In an earlier study, another author described the way he was able to measure the ingestion rate and choice of food particle size of a zooplankton population, by means of the addition of Physostigmine salicylicum to anaesthetize the zooplankton fraction of a plankton sample in an experimental jar. According to the earlier study, this blocking substance should only influence the muscle synapses and should only be considered useful in such investigations as a specific synapse poison. Whereas the earlier study claimed that the drug does not influence photosynthesis, it is shown in the present paper that the drug does in fact inhibit the maximum rate of photosynthesis by 41 percent, and it is further shown that it is the enzymatic processes of photosynthesis that are inhibited in these experiments. It is claimed that the first author did not use optimal experimental circumstances when checking the drug, but instead collected the plankton samples in the summertime when it can be expected that the plankton algae are adapted to optimal photosynthesis at about 20 klux. These first experiments had been carried out at only 2.5 klux, which is far from optimal. The conclusion is that the Physostigmine salicylicum method is invalid for measuring the influence of grazing zooplankton on the algae population. (Harris-Wisconsin)
W77-10149

SEASONAL CHANGES IN TWO ALGAL POPULATIONS FROM THE COASTAL WATERS OF WASHINGTON STATE,
Washington Univ., Seattle. Dept. of Oceanography.
T. Hruby.
The Journal of Ecology, Vol. 63, No. 3, p. 881-889, 1975. 2 fig., 2 tab., 21 ref.

Descriptors: *Rhodophyta, *Marine algae, *Washington, *Uniformity coefficient, *Graphical analysis, *Littoral, Marine biology, Pacific Coast region, Oceanography, Tides, Spatial distribution, Temporal distribution, Mathematical studies, Seasonal.
Identifiers: *Turn Point(San Juan Island Washington), *Rosario Beach(Fidalgo Island Washington), Iradaea cordata(Turner), Bory(Gigartinales), Quadrat analysis.

A study carried out in the coastal waters of Washington at two locations where the summer algal community was dominated by the red algal Iridaea cordata (Turner) Bory (Gigatinales) showed that the summer and winter communities could be differentiated by a similarity coefficient of quantitiative measurement which includes data on algal cover as well as species. The algal species and their coverage within five .25 sq. meter quadrats (measured by hand-placed aluminum frames) were recorded on a monthly basis from October 1972 to October 1973 at two locations in the coastal waters of Washington, off Turn Point on San Juan Island and at Rosario Beach on Fidalgo Island. Both locations had almost level bottoms of at least 300 sq. meters where the slope was less than 3% as measured relative to Mean Lower Low Water. The first quadrat was dropped randomly in the algal bed and subsequent ones were dropped within visual distance of the first. In the study, it was learned that coefficients which use only diversity data provided less information when studying changes in one location. However, the populations of algae were found to be too heterogeneous relative to cover, and valid comparisons between locations could be made only with these diversity-based coefficients. It was also found that the seasonal changes in the algal populations affect the species-area curve that can be plotted for a location. (Harris-Wisconsin).
W77-10150

THE DETERMINATION OF DISSOLVED INORGANIC CARBON, A POSSIBLE SOURCE OF ERROR IN DETERMINING THE PRIMARY PRODUCTION OF LAKE WATER PHYTOPLANKTON,
Helsinki Univ., Lammi (Finland). Lammi Biological Station.
K. Salonen, and A. L. Kotimaa.
Annales Botanici Fennici, Vol. 12, No. 4, 1975, p. 187-189. 1 fig., 1 tab., 8 ref.

Descriptors: *Primary productivity, *Analytical techniques, Eutrophication, *Phytoplankton, Measurement, Laboratory tests, Lakes, *Pollutant identification.
Identifiers: *Dissolved inorganic carbon(DIC), *Indirect DIC determinations, *Acid titration of alkalinity, *Back titration of alkalinity, Infrared gas analyzers.

In other studies made to determine the amount of concentration of dissolved inorganic carbon (DIC) in fresh waters, measurements have been based on indirect determinations of pH, alkalinity, conductivity and temperature. A second method of determining DIC indirectly using acid titration of alkalinity, suggested by some authors, has been known to produce erroneous results in certain instances. The present study was made to obtain a more general picture of the differences between the results of the applied methods in Finnish lakes. DIC was determined both by two indirect methods from pH and from alkalinity and by a direct method using an infrared gas analyzer. When the measurements were taken indirectly by acid titration of alkalinity, the results from weakly-buffered lakes were often tens of percentage points higher than for the results obtained directly with the infrared gas analyzer. When DIC was determined indirectly with back titration of alkalinity, results similar to infrared analysis were found. Based on these results, which were in agreement with those of other investigations, it is concluded that a technique other than the indirect one based on acid tritration of alkalinity should be preferred in the determination of DIC. (Harris-Wisconsin).
W77-10153

A FIELD AND LABORATORY STUDY OF OXYGEN UPTAKE BY PLANKTONIC BLUE-GREEN ALGAE,
Ministry of Agriculture, Antrim (Northern Ireland). Freshwater Biological Investigation Unit.
C. E. Gibson.
The Journal of Ecology, Vol. 63, No. 3, p. 867-879, 1975. 7 fig., 6 tab., 19 ref.

Descriptors: *Cyanophyta, *Oxygen demand, Hypolimnion, Lake morphometry, Dimensions, Optical properties, Photoperiodism, Light.
Identifiers: *Lough Neagh(Northern Ireland), *Oxygen uptake gradients, *Light-stimulated respiration, Oscillatoria redekei van Goor.

The annual cycle of oxygen demand in Lough Neagh (Northern Ireland) is reported, with particular reference to its distribution through the water column. The report is part of a larger study made of such oxygen demand of the lake water to elucidate conditions which bring about de-oxygenation of the water column, since this event is likely to be significant in the ecology of the lake, which has no lasting hypolimnion die to the fact that the lake's largest axis coincides with the prevailing wind and the lake is well-mixed for most of the year. The present study shows that although the lake is unstratified, there is a persistent vertical gradient of dark oxygen uptake. Detailed profiles suggest that this is due to light stimulation of dark respiration rates. A laboratory study of axenic Oxcillatoria redekei van Goor shows that light stimulated respiration up to ten-fold. Carbohydrate contents of the cells were correlated with the respiration rates, both in the field and laboratory observations. It is likely that unless this effect is allowed for, respiration of field populations of blue-green algae is considerably overestimated by the usual methods of measurement in studies of oxygen demand in Lough Neagh. (Harris-Wisconsin).
W77-10154

COMPARATIVE LIMNOLOGY OF DIFFERENTIALLY REGULATED SECTIONS OF A COLORADO MOUNTAIN RIVER,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 6G.
W77-10155

INDICATOR VALUE OF BIOSESTON AND PERIPHYTON FOR EVALUATION OF POLLUTION DEGREE OF FLOWING WATERS, (IN POLISH),
Water Economics Research Inst., Wroclaw (Poland). Water Protection Research Section.
For primary bibliographic entry see Field 5B.
W77-10158

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
For primary bibliographic entry see Field 4C.
W77-10182

DIATOM INDICATOR GROUPS IN THE ASSESSMENT OF WATER QUALITY IN THE JUKSKEI-CROCODILE RIVER SYSTEM (TRANSVAAL, REPUBLIC OF SOUTH AFRICA),
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10193

HEAVY METAL ENRICHMENT IN MINE DRAINAGE: I. THE RUSTENBURG PLATINUM MINING AREA,
Pretoria Univ. (South Africa). Dept. of Chemistry.
G. T. Wittmann, and U. Forstner.
South African Journal of Science, Vol. 72, No. 8, p 242-246, August 1976.

Descriptors: *Heavy metals, Mine water, Sediments, Monitoring, River, Sampling, Environmental effects, Slimes, *Mine wastes, Spectrocopy, *Mine drainage.
Identifiers: South Africa, Platinum, Elands River, Vaalkop Dam, Crocodile River, Bospoort Dam, Olifantsnek Dam, Buffelspoort Dam, Lindleyspoort Dam.

The effect of the mining activities in the Rustenburg area on the metal enrichment of the mines' drainage area was investigated. Histroic review of mining in the area is presented; methods that were used in sampling and analyzing sediment samples taken from rivers and dams in the area are described. The environmental impacts of the mining wastes are discussed and it is concluded that no deleterious heavy metal contamination of the watercourses or man-made impoundements have resulted. In contrast, wastes from hydrometallurgical processes used in the refining of platinum ores on the East Rand contained appreciable amounts of poisonous heavy metals comparable to those of the gold mining industry. (So African Water Info Center)
W77-10199

SYNERGISTIC EFFECTS OF MARINE POLLUTION,
Leeds Univ. (England). Wellcome Marine Lab.
J. S. Gray.
South African Journal of Science, Vol. 72, No. 2, p 35-36, February 1976. 1 fig.

Descriptors: Chemicals, Growth rate, Bioassay, Mixtures, Metals, Water pollution effects, Protozoa, Marine microorganisms, *Estuarine environment, Estuaries.
Identifiers: *River Tees Estuary(England), North Sea, *Cristigera, Capitella capitata, *Synergism, *Marine pollution.

A more sensitive test has been developed for investigating the effects of chemical pollutants on marine organisms, including the effects of mixtures of pollutants. The reduction in the growth rate of a ciliate protozoan, Cristigera, was used as a criterion of pollution. The laboratory investigations were extended to the estuary of the Tees, a heavily polluted river on the east coast of England. Estuarine meiofaunal species were probably the least sensitive of all to pollution stress. (So African Water Info Center)
W77-10202

CADMIUM CONCENTRATIONS IN THE TISSUES OF BULLIA DIGITALIS (PROSOBRANCHIATA) FROM THE SOUTH AFRICAN WEST COAST,
Cape Town Univ. (South Africa). Dept. of Zoology.
K. C. Cuthbert, A. C. Brown, and M. J. Orren.
South African Journal of Science, Vol. 7, No. 2, p 57, February 1976. 1 tab, 8 ref.

Descriptors: Beaches, *Cadmium, Metals, Heavy metals, Scavengers, Animal behaviour, Experiments, Marine animals, Sea water, Bioindicators, Snails, Industrial wastes, Oxygen demand, *Gastropods, Pollution abatement, *Ecology, Pollutant identification.
Identifiers: *South Africa(West Coast), *Bullia digitalis.

Bullia digitalis Meuschen is a prosobranch gastropod which occupies an important position in the ecology of temperature sandy beaches in Southern Africa, and has been used for monitoring pollution in several studies. An investigation of whole body and visceral cadmium concentrations was undertaken and indicates an unexpectedly high cadmium content of the untreated animals. (So African Water Info Center)
W77-10203

METALS IN ORGANISMS FROM SALDANHA BAY AND LANGEBAAN LAGOON PRIOR TO INDUSTRIALIZATION,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
H. O. Fourie.
South African Journal of Science, Vol. 72, No. 4, p 110-113, April 1976. 3 fig, 3 tab, 6 ref.

Descriptors: *Cations, *Estuarine environment, Ecology, Ecosystems, *Metals, Iron, Industrial wastes, Bioindicators, Clams, Oysters, Mussels, Lobsters, Marine animals, Marine plants, Heavy metals, Trace elements, Pollutant identification.
Identifiers: *Saldanha Bay(South Africa), Langebaan Lagoon(South Africa), Ulva, Mactra, Crassostrea, Abalone, Chloromytilus, Haliotis, Jasus, Pyura.

An intensive research program has been initiated prior to extensive industrial development of Saldanha Bay. The purpose is to establish existing background levels of metals in the marine organisms of the area; to monitor any future metal pollution by means of indicator species; and to obtain information on inter-element relationships and the relationship between accumulation and size or age of indicator species. Preliminary findings on the levels of Fe, Zn, Cu, Mn, Pb, Cd, Ni, Al, Bi, Sb, Cr and Hg are reported. Crassostrea gigas and C, margaritacea were suitable indicator organisms. (So African Water Info Center)
W77-10205

THE SEASONAL HAEMATOLOGY OF THE SMALL-MOUTH YELLOWFISH (BARBUS HOLUBI),
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
J. H. Van Vuuren, and J. H. Hattingh.
Zoologica Africana, Vol. 11, No. 1, p 81-86, 1976. 1 fig, 2 tab, 9 ref.

Descriptors: Fish, *Seasonal, Electrophoresis, Laboratory studies.
Identifiers: Barbus holub, South Africa, Lsucocytes, Erytrocytes, *Haematology, *Yellow fish.

Haematological parameters in small-mouth yellowfish (Barbus holubi) have been examined from February to November. Seasonal variations were observed in several of the parameters studied. Sexual differences were slight and no significant changes in haematology could be related to breeding season. The results are discussed in relation to other published observations. (So African Water Info Center)
W77-10215

A SEASONAL STUDY OF THE HAEMATOLOGY OF CARP (CYPRINUS CARPIO) FROM A LOCALITY IN THE TRANSVAAL, SOUTH AFRICA,
Randse Afrikaanse Universiteit, Johannesburg (South Africa). Dept. of Zoology.
L. R. Fourie, and J. Hattingh.
Zoologica Africana, Vol. 11, No. 1, p 75-80, 1976. 1 tab, 1 fig, 3 ref.

Descriptors: *Seasonal, Fish, *Carp, Electrophoresis, Laboratory studies, Breeding.
Identifiers: Leucoytes, Erythorocytes, *Haemoglobin, Transvaal(South Africa).

Various haematological parameters of carp blood were examined on a monthly basis from February to November. Seasonal variations were observed in red and white blood cell counts, in haemoglobin and plasma protein concentrations and in mean corpuscular gragilities. Sexual differences were evident in red blood cell counts, haematocrit values and haemoglobin concentrations. Plasma protein electrophoresis showed marked conformational changes during the study period. The results are discussed in relation to previous findings and also in relation to the use of blood as a possible indicator of breeding season in carp. (So African Water Info Center)
W77-10216

APPARATUS FOR THE AUTOMATIC DETERMINATION OF OXYGEN CONSUMPTION IN FISH,
Port Elizabeth Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W77-10217

DETECTION OF L-ASPARTATE: 2-OXOGLUTARATE AMINOTRANSFERASE IN TWO NITROGEN-FIXING CYANOPHYTA,
National Inst. for Water Research, Pretoria (South Africa).
D. J. Barlow, and W. E. Scott.
South African Journal of Science, Vol. 72, No. 8, p 240-242, August 1976. 8 fig, 14 ref.

Descriptors: *Cyanophyta, Anabaena, *Eutrophication, Nitrogen fixation, Electron microscopy, Ammonia, Enzymes, *Pollutant identification.
Identifiers: Nodularia, South Africa, Nitrogenase.

The heterocyst of aerobic nitrogen-fixing Cyanophyta contains nitrogenase capable of converting atmospheric nitrogen to ammonia. The activity sites were determined by means of both light and electron microscopy. A transamination gradient down the vegetative filament and several sites of active production in vegetative cells were identified. (So African Water Info Center)
W77-10223

BROWN TROUT (SALMO TRUTTA L.) GROWTH AT REDUCED PH,
Oslo Univ. (Norway). Inst. of Zoology.
O. J. Jacobsen.

Descriptors: *Brown trout, *Hydrogen ion concentration, *Environmental effects, *Growth rate, *Aquaculture, *Acidity, Trout, Water quality, Acidic water, Freshwater fish, Bioassay, Pollutant identification.

The growth of brown trout (Salmo trutta) yearlings (18 months) was studied at environmental pH levels of about 6.26, 5.44 and 5.00 and a daily ration of 2.9% of the initial body weight. Growth increments for fish at each pH level during a 48-day period were similar. (Katz)
W77-10227

INDICATORS OF HEAVY-METAL CONTAMINATION IN THE LOOE ESTUARY (CORNWALL) WITH PARTICULAR REGARD TO SILVER AND LEAD,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5A.
W77-10228

LIMB REGENERATION IN FIDDLER CRABS: SPECIES DIFFERENCES AND EFFECTS OF METHYLMERCURY,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
J. S. Weis.
Biological Bulletin, Vol. 152, p 263-274, April 1977. 2 fig., 2 tab., 28 ref.

Descriptors: *Growth rates, *Life cycles, *Pigments, *Crabs, *Mercury, Water pollution effects, *Metals, *Animal physiology, Salinity, Seasonal, Inhibitors, Environmental effects, Laboratory tests, Invertebrates, Crustaceans, Tropical regions, Shellfish, Period of growth.
Identifiers: *Methylmercury, *Limb regeneration(Crabs).

When kept under identical conditions, Uca pugnax regenerates limbs and molts more rapidly than U. pugilator from the same location. The tropical species U. rapax and U. speciosa also regenerate faster than U. pugilator from the same location. When kept in groups, U. thayeri stops regeneration after basal growth and will not molt; U. pugilator is only slightly retarded when kept in groups. U. rapax is also affected by grouping, showing a lengthened proecdysial phase and terminal plateau, thus also delaying molting. Newly regenerated limbs are lighter in color than old limbs and are conspicuously banded. In U. pugilator the pale color remains for several months under laboratory conditions. When treated with 0.5 mg/liter methymercury, growth was inhibited entirely in U. thayeri. Partial inhibition was seen in U. pugilator, and the least inhibition in U. rapax with a few individuals completing regeneration of limbs containing no melanin. The lack of black pigment may be due to an inhibition of cell migration when kept in clean water after ecdysis. Seasonal differences were noted in all species. (Katz)
W77-10229

RESPONSES OF MOSQUITOFISH (GAMBUSIA AFFINIS) TO ASH EFFLUENT AND THERMAL STRESS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
D. S. Cherry, R. K. Guthrie, J. H. Rodgers, Jr., J. Cairns, Jr., and K. L. Dickson.
Transactions of the American Fisheries Society, Vol. 105, No. 6, p 686-694, 1976. 2 tab, 4 fig, 24 ref.

Descriptors: *Thermal stress, *Water temperature, *Heated water, Freshwater fish, *Powerplants, *Lethal limit, *Fish beavior, *Turbidity, *Metals, Water pollution sources, *Chlorine, Zinc, Calcium, Bromine, Habitats, Laboratory tests, Impaire water quality, Pollutants, Dissolved oxygen, Mortality, Trace element, Water analysis, Thermal water, *South Carolina.
Identifiers: *Mosquitofish, Avoidance, *Coal ash.

Mosquitofish, the only fish species inhabiting a drainage system that received high coal ash concentration at one end and thermal discharges at the other, appeared to successfully function in this environment with no apparent detrimental effects. Temperature conditions (44.5 C) were more limiting to the species' functional capcity than was coal ash turbidity (275 JTU) with high metal concentrations. Laboratory preference, avoidance, and lethal temperature trials supported the field observations. Mosquitofish had a final temperature preferendum at 34.7-35.1 C (both individual and group response), an upper temperature avoidance at 39 C when acclimated at 30 and 36 C, and an upper lethal temperature limit at 38 C. The species survived in this aquatic system in which elemental concentrations, determined by neutron activation analysis, were sufficiently high to be lethal to other fish species according to values from the literature and by in situ toxicity tests. Of the 40 elements measured, five (calcium, chlorine, selenium, zinc, and bromine) appeared to be concentrated by the mosquitofish, while the others were most highly accumulated in the benthic sediments. (Katz)
W77-10230

THE ROLE OF EFFLUENTS IN THE SPREAD OF SALMONELLAE, (IN DUTCH),
W. Edel, P. A. M. Guinee, M. Van Schothorst, and E. H. Kampelmacher.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe A Med Mikrobiol Parasitol. 221(4); p 547-549, 1972.

Descriptors: *Salmonella, Effluents, Food chains, Human diseases, Public health, Feeds, Disinfection, Path of pollutants.
Identifiers: Salmonella-Panama, Salmonella-Typhimurium.

Morbidity reports from 1960-1971 prove the continuous presence of certain serotypes such as Salmonella typhimurium and S. panama in humans. These types are probably cycling from animals through meats to consumers and from patients and healthy carriers through effluent and surface waters to animals as well as food. Feeds should be pelleted and effluent waters should be disinfected.--Copyright 1974, Biological Abstracts, Inc.
W77-10231

THE MACROBENTHIC FAUNA OF ROCKS AND BOULDERS IN THE LUBECK BAY (WESTERN BALTIC SEA) INVESTIGATED FROM THE UNDERWATER LABORATORY 'HELGOLAND',
Trondheim Univ. (Norway). Biological Station.
B. Gulliksen.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 27, p 439-449, 1975. 2 tab, 3 fig, 18 ref.

Descriptors: *Benthic fauna, *Biological communities, *On-site investigations, *On-site data collections, *Distribution, *Benthos, *Aquatic habitats, Sampling, Algae, Invertebrates, Spatial distribution, Temporal distribution, Bottom sediments, Marine animals.
Identifiers: *Lubeck Bay(Baltic Sea), *Dendrodoa, *Polydora, *Polychaaetes, Angle of inclination.

A comparison of the faunal composition with the angle of inclination of the substrates was investigated through the use of a diver-operated suction sampler in Lubeck Bay (Western Baltic Sea). The ascidian Dendrodoa grossuiaria and the polychaete Polydora ciliata constituted 95.6% of the total number of specimens samples. The lowest densities of both species occurred on overhanging substrates. In general, the angle of inclination of the substrate bore little relation to the qualitative composition of the fauna, but some of the species were more sparsely distributed on overhanging substrates. The three most abundant species (Dendrodoa, Polydora, and Nereimyra punctata) showed some degree of aggregated distribution according to FISHER'S 'coefficient of dispersion.' For the ultimate picture of the composition of fauna on rocky bottom substrates, the time of day at which the samples are taken is of importance, due to varying degrees of activity of motile benthic invertebrates. (Katz)
W77-10232

SURVIVAL OF MARINE PHYTOPLANKTON IN HIGH CONCENTRATIONS OF HEAVY METALS, AND UPTAKE OF COPPER,
Marine Lab., Aberdeen (Scotland).
J. A. Bentley-Mowat, and S. M. Reid.
Journal of Experimental Marine Biology and Ecology, Vol. 26, p 249-264, 1977. 14 fig, 20 ref.

Descriptors: *Absorption, *Copper, *Lead, Cadmium, *Growth rates, *Marine microorganisms, *Phytoplankton, *Plant physiology, *Inhibitors, *Mortality, Metals, Marine plants, Primary productivity, Environmental effects, Toxicity, Laboratory tests, *Heavy metals.
Identifiers: *Phaeodactylum, *Tetraselmis, *Dunaliella, *Cricosphaera, Ditylum, *Sublethal effects.

The growth of Phaeodactylum tricornutum, Tetraselmis spp., Dunaliella primolecta, and Cricosphaera elongata in batch culture in S88 medium is not arrested on addition of copper, cad mium or lead below a concentration of 10-4M. In contrast, Ditylum brightwelli undergoes osmotic disturbances in 10-5M and 10-4M copper, with swelling of the cell contents. Phaeodactylum grown in continuous culture survives single doses of up to 10-3M copper with no diminution in growth and with considerable uptake of cooper. Cricosphaera in continuous culture survives up to 10-4M copper with no long-term diminution in growth, but takes up between ten and a hundred times less copper than Phaeodactylum. (Katz)
W77-10233

THE EFFECT OF A NO. 2 FUEL OIL AND SOUTH LOUISIANA CRUDE OIL ON THE BEHAVIOR OF THE SOFT SHELL CLAM, MYA ARENARIA L.,
Rutgers - The State Univ., Newar, N. J. Dept. of Zoology and Physiology.
D. M. Stainken.
Bulletin of Environmental Contamination and Toxicology, Vol. 16, No. 6, p 724-29, 1976. 1 tab, 16 ref.

Descriptors: *Clams, Animal behavior, *Oil wastes, Environmental effects, *Lethal limit, *Water temperature, *Mollusks, *Bioassay, *Oil pollution, *Fuels, Animal physiology, Laboratory tests, Metabolism, Water pollution effects, Benthic fauna.
Identifiers: *Sublethal effects, *Crude oil.

The sublethal effects of No. 2 fuel oil and a South Louisiana crude oil on the soft shell clam, Mya arenaria, were studied in tests conducted at 4 and 14C, to simulate winter oil-spill conditions. At oil concentrations of 50 ppm, mucus was given off through the pedal opening and siphon. Higher oil concentrations resulted in poportionally higher mucus secretion, although crude oil effects were never as severe as the effect of fuel oil. Both oils depressed muscular contraction. At concentrations greater than 100 ppm, the pedal opening musculature became totally relaxed and did not contract. The adductor muscles also lost the ability to contract rapidly. These reponses were enhanced at 14C compared to 4C. The response of clams to phenol was slightly different with less mucus secretion. Muscles remained at one length, turgid, and lost their irritability. The energy drains imposed on the clam by mucus production and expulsion, and resulting disruption of normal feeding mechanisms occurred at oil concentrations far below the LC50. (Katz)
W77-10234

THE SENSITIVITY OF YOUNG SALMONIDAE TO OXYGEN DEFICIENCY,
All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).
L. B. Klyashtorin.
Journal of Ichthyology, Vol 15, No 2, p 337-341, 1975. 3 fig, 9 ref.

Descriptors: *Dissolved oxygen, *Salmonids, *Juvenile fish, *Oxygen requirements, *Sockeye salmon, *Chinook salmon, *Fish physiology, *Resistance, Laboratory tests, Sport fish, Trout.

Young char (Salvelinus alpinus), coho salmon (Oncorhynchus kisutch), chinook salmon (O. tschawytscha) and sockeye salmon (O. nerka) were used in studies to determine the range of oxygen content essential to maintain normal vitality in the fish. The critical oxygen at which oxygen consumption remains at the level of the standard

metabolism, differ negligibly for the four young salmonids and fluctuate between 33-35 mmHg at 10 degrees. The threshold oxygen concentration, the level at which death of the animal from asphyxiation begins, were also similar, at 19.5-18.0 mmHg. The relative resistance of young salmonids to oxygen deficiency tends to increase in the following order: sockeye, chinook salmon, coho salmon, char. From the critical and threshold oxygen concentration values of the fishes, the P95 (value of the partial pressure of oxygen at which the blood is saturated to 95%) and P50 hemoglobin values of their blood may be approximately evaluated. (Katz)
W77-10235

REACTIONS OF YOUNG SALMONIDS TO CERTAIN NATURAL CHEMICAL STIMULI,
Moscow State Univ. (USSR). Dept. of Ichthyology.
Y. A. Marusov.
Journal of Ichthyology, Vol 15, No 2, p 341-343, 1975.

Descriptors: *Fish behavior, *Salmonids, *Atlantic salmon, *Brown trout, *Rainbow trout, Fish physiology, *Juvenile fish, Laboratory tests, Fish food organisms, Trout, Sport fish, Animal behavior.
Identifiers: Aggressive behavior(Fish), Skin extract, *Chemical stimuli.

Yearling Salmo salar, Salmo trutta, and Salmo gairdneri were exposed to aqueous extracts from the skin of salmonids and water from food items in running water aquarium. A characteristic feeding reaction was noted in most cases in the experimental fish during the action of extracts from live food items. This was expressed in a noticeable increase in the motor activity of the fish, agitated fin movements and the seizing of particles of sludge carried towards the fish by the current. No upward swimming toward the source of the stimulus was observed. When there were refuges in the aquarium, the fishes did not leave them which is probably connected with the fact that young salmonid fish usually catch food items that pass by them in the current. The reactions to the fish to the action of aqueous extracts from the skin were reminiscent of the feeding reaction, but the fish did not seize mud particles. Individual fishes were seen to make unusual movements, seeming to roll from side to side, and failing to seek refuge. The rhythm of the gill covers was frequently disturbed in the fish. In separate experiments, agressive behavior and fighting was observed in young S. salar and steelhead in response to the addition of extract from their own species. Salmon yearlings didn't react to extracts from underyearlings. (Katz)
W77-10236

TEMPERATURE AND RATE OF GASTRIC EVACUATION BY RAINBOW TROUT, SALMO GAIRDNERI,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
J. T. Windell, J. F. Kitchell, D. O. Norris, J. S. Norris, and J. W. Foltz.
Transactions of the American Fisheries Society, Vol 105, No 6, p 712-717, November, 1976. 4 tab, 18 ref.

Descriptors: *Environmental effects, *Rainbow trout, *Water temperature, Analytical techniques, *Digestion, Fish physiology, *Fish diets, *Oligochaetes, Pollutant identification, Regression analysis, Temperature, Laboratory tests, Metabolism, Animal physiology.
Identifiers: *Gastric evacuation.

Young-of-the-year hatchery reared rainbow trout, Salmo gairdneri, were used to estimate the rate of gastric evacuation of meals of oligochaetes and commercial pellets at water temperatures of 5, 10, 15, and 20C. Different regression models produced different predictions for 25, 50, and 100% stomach emptying times for pellet meals consumed at 15C. Greatest variation occurred when predicting time required for 100% stomach evacuation. Estimates ranged from 22 to 35 h for a substantial 13-h difference. Because the semilog model consistently produced the highest F regression and the lowest F deviation it was selected as best for describing the data. Rate of gastric evacuation increased with increased temperature. Differences were greatest between 0 and 5C and least between 15 and 20C. An increase of 5C at the low end of the temperature range produced a much greater absolute effect than at the high range. Depending on food type, it took 3 to 4 times as long to empty the stomach by 50% or 100% at 5C as it did at 20C. Time to empty the stomach increased from a minimum of 16.4h at 20C for both foods to 58.5 h and 72.4 h at 5C for oligochaetes and pellets, respectively. (Katz).
W77-10237

MALACOLOGICAL STUDIES IN THE LUFIRA (KATANGA) ARTIFICIAL LAKE AREA: DISTRIBUTION AND ECOLOGY OF AQUATIC MOLLUSCS: EPIDEMIOLOGICAL ROLE OF INTESTINAL AND URINARY BILHARZIOSIS VECTORS, (IN DANISH),
G. Mandahl, F. Malaisse, and C. Ripert.
Bull Soc Pathol Exot. 65(1), p 146-165, 1972.

Descriptors: Africa, Lakes, Distribution, Ecology, *Epidemiology, Mollusks, Roots, Public health, Human diseases.
Identifiers: *Bilharziasis vectors, Biomphalaria-pfeifferi, Biomphalaria-sudanica-rugosa, Bulinus-globosus, *Congo, Katanga, Lymnaea-natalensis, Manioc, Reeds, Schistosoma-haematobium, Schistosoma-mansoni, *Malacological studies, *Lufira Lake(Congo).

The results of the malacological survey carried out in the Lufira lake area (Congo, Africa) agree with those of the study of the prevalence in man of intestinal and urinary bilharziosis. Bulinus globosus, an ubiquous species common in the lake, rivers, marshes, springs, irrigation canals, and the only vector of Schistosoma haematobium, is the 2nd most abundant species in the region. Lymneae natalensis, the most abundant species, is found in almost all biotopes where the stream is slow or null, even in putrid sites, almost desiccated or containing many manioc roots, where the molluscs are amphibious. Biomphalaria pfeifferi, vector of Schistosoma mansoni, is less often found, although it can develop in less clear and less oxygenated waters than Bulinus; it has never been found in the lake, which constitutes a separate ecosystem. Among potential vector species, Biomphalaria sudanica rugosa has the most strict ecology; it is limited to the reed-beds of the lake shore. However, this species does not seem to play an important part in S. mansoni transmission, although it is receptive to S. mansoni under laboratory conditions. Just as urinary bilharziosis is more frequent in the area than intestinal bilharziosis, B. globosus is more frequent than B. pfeifferi. The Bulinus and Biomphalaria species of the region resist desiccation in the sites where water completely evaporates only during the 2nd part of the dry season. Biotopes which are totally dry for many months do not contain any vector. The ports of the lake do not constitute a significant reservoir for intermediary hosts of schistosomas. The transmission sites in this area (about 285 km2) are practically reduced to 4 (S. haematobium) and 2 (S. mansoni). These observations on limitation of the number and extension of transmission sites is fundamental for the control of bilharziosis endemia.--Copyright 1974, Biological Abstracts, Inc.
W77-10238

A STUDY OF THE EFFECTS OF COPPER APPLIED CONTINUOUSLY AND DISCONTINUOUSLY TO SPECIMENS OF MYTILUS EDULIS (L.) EXPOSED TO STEADY AND FLUCTUATING SALINITY LEVELS,
Natural Environment Research Council, Bangor (Wales). Unit of Marine Invertebrate Biology.
J. Davenport.
Journal of the Marine Biological Association of the United Kingdom, Vol 57, p 63-74, 1977. 10 fig, 5 ref.

Descriptors: *Mussels, *Animal behavior, *Copper, *Salinity, *Toxicity, *Mortality, *Lethal limit, *Copper sulfate, *Bioindicators, *Monitoring, Environmental effects, Laboratory tests, Water pollution effects.
Identifiers: *Avoidance.

The survival and behavior of specimens of Mytilus edulis exposed to discontinuous and continuous regimes was investigated in both fluctuating salinity conditions and in constant full strength sea water. Copper at 0.5 and 0.25 ppm, constant level, caused damage to mussels within 1-2 days; the M.L.T. for 0.5 ppm copper ion (as Cu+2) was about 2 days and for 0.25 ppm it was 4-5 days. In full strength sea water a 6 h on 6 h off regime of 0.5 ppm copper ion caused no damage in 5 days and it was found that this was due to the ability of Mytilus to detect copper in its environment and to close its shell valves to avoid the detrimental consequences of exposure to copper. In fluctuating salinity regimes it was found that the timing of copper delivery was extremely important; animals survived copper delivery occurring at low or falling salinities because of interacting closure responses to copper and low salinities. It is suggested that these results cast doubt upon the usefulness of Mytilus, and other animals which possess similar closure mechanisms, in the role of a biological pollutant monitoring system. (Katz)
W77-10239

INTENSIVE POLYCULTURE OF FISH IN FRESHWATER PONDS. I. SUBSTITUTION OF EXPENSIVE FEEDS BY LIQUID COW MANURE,
Hebrew Univ., Jerusalem (Israel). Dept. of Genetics.
R. Moav, G. Wohlfarth, G. L. Schroeder, G. Hulata, and H. Barash.
Aquaculture, Vol. 10, p 25-43, 1977. 4 tab, 7 fig, 15 ref.

Descriptors: *Aquaculture, *Fish diets, *Aquatic productivity, *Tilapia, *Farm wastes, *Carp, *Stagnant water, Fish management, Fish populations, Pounds fish per acre, Nutrients, Diets, Freshwater fish, Growth rates, *Sewage.
Identifiers: *Cow manure.

Nine experimental treatments of fish polyculture in stagnant water ponds without aeration were conducted. The polyculture was composed of common carp, silver carp, white amur (grass carp) and Tilapia. The treatments differed in stocking densities, feeding, and manuring levels. The most productive treatment of the experiment, in which the fish were fed protein-rich pellets, produced 50 kg/ha per day. Two treatments (low and high stocking densities) fed exclusively with liquid cow manure produced an average yield of around 32 kg/ha per day. The yields of the treatment receiving high-protein pellets exceeded those of the treatments receiving grain pellets by 20 and 9.6 kg/day per ha, at high and low stocking densities, respectively, and justified the extra cost of high-protein feed. The common carp and white amur showed the greatest responses to increased feeding inputs while the silver carp and Tilapia, even at high densities, have done as well at low feeding levels. Total body fat contents of the common carp were 20%, 15%, and 6.2% when fed with high-protein pellets, grain pellets, and liquid cow manure, respectively. (Katz)
W77-10240

EFFECTS OF LIGHT AND AMMONIUM ON NITRATE UPTAKE BY TWO SPECIES OF ESTUARINE PHYTOPLANKTON,
City Coll., New York. Dept. of Biology.
S. S. Bates.
Limnology and Oceanography, Vol. 21, No. 2, p 212-218, 2 tab, 4 fig, 20 ref.

Descriptors: *Photosynthesis, *Light, *Ammonium compounds, *Nitrates, *Absorption, *Primary productivity, *Nutrient removal, *Chlorophyta, *Algae, *Estuaries, Light intensity, Nitrogen compounds, Kinetics, Environmental effects, Laboratory tests, Estuarine environment, *New York.
Identifiers: *Skeletonema, *Hudson River(New York).

The incident light intensity, preconditioning light history, and the presence or absence of ammonium affected the rate of nitrate uptake by a chlorophyte and Skeletonema costatum isolated from the Hudson estuary. In the absence of ammonium, shade-adapted cells reached the highest maximum velocity of nitrate uptake. S. costatum had a lower half-saturation constant for light than the chlorophyte and reached a greater maximum velocity of nitrate uptake. In the presence of ammonium, nitrate uptake was depressed at all light intensities, but more in shade-adapted than in sun-adapted cells of both species, and more in S. costatum than in the chlorophyte. The maximum velocity of ammonium uptake was greater in shade-adapted than in sun-adapted cells. Since nitrate and ammonium uptake were related to the chlorophyll a content of the cell, energy for uptake was probably derived primarily from photosynthesis in the light but may also be derived from respiration since substantial dark uptake was observed, especially in S. costatum. (Katz)
W77-10241

A DESCRIPTIVE EVALUATION OF THE EFFECTS OF NO. 2 FUEL OIL ON THE TISSUES OF THE SOFT SHELL CLAM, MYA ARENARIA L.,
Industrial Environmental Research Lab.-Cincinnati, Edison, N.J. Oil and Hazardous Materials Spills Branch.
D. M. Stainken.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 6, p 730-738, 1976. 1 tab, 3 fig, 25 ref.

Descriptors: *Oil wastes, *Water pollution effects, *Clams, *Animal pathology, *Cytological studies, Feeding rates, Absorption, Oil spills, Shellfish, Invertebrates, Environmental effects, Laboratory tests, *Oil pollution.
Identifiers: *Mya arenaria, *Sublethal effects, Histological changes, *Leukocytosis.

The soft shell clam, Mya arenaria, was exposed to emulsions of No. 2 fuel oil having concentrations of 10, 50, and 100 ppm for 28 days to simulate contact with winter oil spills. No radical tissue aberrations were observed at any oil concentration. At 100 ppm, some edema of the pallial muscle was observed. Leukocytes were observed in the pallial blood sinuses, under the mantle epithelium and within the anterior adductor muscle. The intestine, style cac, and diverticula appeared very vacuolar. At 50 ppm, the effects were less marked except in the diverticula and intestine. The clams exposed to 10 ppm showed some reduction in size of diverticula, and the diverticula, stomach and intestine were vacuolated in appearance. The vacuolization appeared in all clams and seemed to result from the laboratory environment. However, this effect was exacerbated in the oil exposed clams compared to controls. Cellular glycogen content was depleted and a reduction in cellular cytoplasm was observed, most markedly in clams exposed to 100 ppm oil, but also in clams exposed to 50 ppm. This may be a result of reduced feeding. (Katz)
W77-10243

THE ECOLOGY OF EELGRASS, ZOSTERA MARINA (L.), FISH COMMUNITIES. I. STRUCTURAL ANALYSIS,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
S. M. Adams.
Journal of Experimental Marine Biology and Ecology, Vol. 22, p 269-291, 1976. 7 fig, 9 tab, 31 ref.

Descriptors: *Biomass, *Fish populations, *Aquatic habitats, *Standing crop, *Biological communities, *Seasonal, *Shallow water, *Productivity, *Distribution patterns, Water temperature, Environmental effects, Primary productivity, Temporal distribution, North Carolina.
Identifiers: *Eelgrass, *Zostera, *Pinfish, *Caloric content, Lagodon.

Fish populations utilizing eelgrass, Zostera marina, beds in two different estuarine areas near Beaufort, North Carolina were analysed and compared to determine aspects of their community structure. The fish community of the eelgrass beds was characterized by low diversity and high standing crops of biomass and energy, both of which showed seasonal variation. Wide temperature fluctuations due to the shallowness of the beds probably regulated the diversity of fish utilizing the beds. Pinfish dominated the community, making up 45% and 67% of the fish biomass in the Phillips Island and Bogue Sound beds, respectively. Changes in total body caloric content were probably related to developmental stages and changes in diet. There was a significant correlation between fish biomass, temperature, and Zostera biomass. Fish biomass was highest when temperature and grass biomass were at a maximum. In general, water depth over the beds had little effect on the standing crop of fish within the bed, but cooler waters which occurred at night, darkness, or both, had a large effect. (Katz)
W77-10244

THE EFFECTS OF TEMPERATURE AND SALINITY ON THE EMBRYONIC DEVELOPMENT OF HYDROBIA ULVAE (PENNANT),
University Coll. of Wales, Aberystwyth. Dept. of Zoology.
J. D. Fish, and S. Fish.
Journal of Marine Biological Association of the United Kingdom, Vol. 57, p 213-218, 1977. 2 fig, 1 plate, 10 ref.

Descriptors: *Water temperature, *Salinity, *Embryonic growth stage, *Hatching, *Larval growth stage, *Environmental effects, *Snails, *Pigments, Invertebrates, Mollusks, Aquatic animals, Laboratory tests, Marine animals.
Identifiers: *Hydrobia ulvae, *Dovey estuary(Wales).

The effects of temperature and salinity on the rate of embryonic development and the survival of embryos to hatching have been analysed by fitting surface responses. Percentage survival is high over a wide range of temperature/salinity combinations and the estimated optimum combination of temperature and salinity is 19.9C and 37.6/ooS. Hatching was recorded in salinities ranging from 8-60/oo and at temperatures up to 35C. The minimum time taken to hatching (5 days) was recorded over a range of 13-41/oo and 22.5-33C; at higher salinities embryonic development is prolonged. The intensity of pigmentation of the veliger larvae is related to the salinity of the sea water in which development takes place; embryos incubated in low salinities hatch as larvae with little pigmentation, while those incubated in high salinities show intense pigmentation. (Katz)
W77-10245

EFFECTS OF FISH FACTORY EFFLUENT ON THE BENTHIC MACROFAUNA OF SALDANHA BAY,
Cape Town Univ. (South Africa). Dept. of Zoology; and Department of Planning and the Environment, Capetown (South Africa).
N. D. Christie, and A. Moldan.
Marine Pollution Bulletin, Vol. 8, No. 2, p 41-45, February 1977. 5 fig, 3 tab, 20 ref.

Descriptors: *Benthic fauna, *Water pollution effects, *Biomass, *Biological communities, Populations, *Organic wastes, *Distribution patterns, *Bottom sampling, *Anaerobic conditions, Industrial wastes, Sampling, Biochemical oxygen demand, Decomposing organic matter, Invertebrates, Mortality, Africa.
Identifiers: *Saldanha Bay(South Africa), *Species diversity.

A survey was conducted adjacent to a pelagic fish canning factory in Saldanha Bay, South Africa, to determine the effects of effluent on the benthic macrofauna. Pairs of samples were taken using Scuba diving techniques at each of five stations situated at increasing distances from the factory. The benthic macrofauna was analysed using numerical methods of classification and ordination thereby defining three groups of stations. The macrofauna nearest the factory was impoverished with several species having only small individuals but with distance from the factory species richness, species density, density of individuals and ash-free biomass increased. Although conditions adversely affected some of the macrofauna at the five stations, the situation has undoubtedly improved since June 1972, when a hugh benthic mortality occurred. (Katz)
W77-10246

EFFECTS OF POLLUTING SUBSTANCES ON ENZYMES OF AQUATIC ORGANISMS,
Washington Univ., Seattle. Coll. of Fisheries.
G. W. Brown, Jr.
Journal of the Fisheries Research Board of Canada, Vol. 33, No. 9, p 2018-2022, 1976. 1 fig, 2 tab, 25 ref.

Descriptors: *Enzymes, *Heavy metals, *Metabolism, *Rainbow trout, *Bioassay, *Inhibitors, Copper, Mercury, Lead, Cadmium, *Toxicity, Biochemistry, Environmental effects, Laboratory tests, Zinc.
Identifiers: Endistylia, Adaptation, Polychaetes.

The toxicity of heavy metal cations often considered as pollutants is discussed with respect to several enzymes of nitrogen metabolism in the trout Salmo gairdneri and the polychaete Endistylia vancouveri. Data on trout liver ornithine aminotransferinase (EC 2.6.1.13) activity under inhibition by mercuric ion yield a straight line when percent inhibition on a probability axis is plotted versus logarithm of mercuric ion concentration. Allantoinase (EC 3.5.2.5) of E. vancouveri is inhibited by divalent cations of Cu, Hg, Zn, Pb, and Cd. At low concentrations (about 10-8M) these ions lead to an enhancement of activity of allantoinase. A short review is provided on the adaptation of fish to environmental changes. (Katz)
W77-10247

FATTY ACIDS AS ICHTHYOTOXIC CONSTITUENTS OF A GREEN ALGA CHEATOMORPHA MINIMA,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
N. Fusetani, C. Ozawa, and Y. Hashimoto.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 42, No. 8, 1976. 1 tab, 2 ref.

Descriptors: *Toxins, *Aquiculture, *Chlorophyta, *Mortality, *Pollutant identification, *Organic acids, Larval growth stage, Oysters, Chemical analysis, Analytical techniques, Algae, Periphyton, Toxicity.

Identifiers: *Cheatomorpha, *Ichthyotoxins, *Fatty acids, Hemolysis.

High mortality of pearl oyster larvae, was observed in tanks having microalgae on the inside wall. The green algae, Cheatomorpha minima, comprised the major portion of the specimen analyzed for its ichthyotoxic constituents. Extraction by organic solvents produced a substance consisting mainly of four fatty acids, which killed killifish in 120 min at 50 ppm and showed a hemolytic activity of 1.99 SU/mg. (Katz)
W77-10248

UPTAKE FROM SEA WATER AND CLEARANCE OF 14C-P,P'-DDT BY THE MARINE COPEPOD CALANUS FINMARCHICUS,
Bedford Inst. of Oceanography, Dartmouth (Nove Scotia).
G. C. H. Harding, and W. P. Vass.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 2, p 177-182, February 1977. 4 tab, 2 fig, 15 ref.

Descriptors: *DDT, *Mathematical models, *Absorption, *Path of pollutants, *Carbon radioisotopes, *Analytical techniques, *Copepods, Pesticides, Crustaceans, Invertebrates, Plankton, Zooplankton, Chlorinated hydrocarbon pesticides, Seawater.
Identifiers: Bioaccumulation, *Calanus finmarchicus.

It is impossible to measure the uptake rate of p,p'-DDT by copepods from sea water directly since uptake and depuration occur simultaneously. Copepods were found to lose DDT exponentially in flowing sea water. Five experiments were performed to obtain uptake rates with DDT concentrations ranging from 32.5 to 1337 pptr in sea water. A model for copepods uptake of DDT was determined which accounts for influx and efflux of DDT. Calculated influx rate constants varied between 1.5 and 2.7 x 103/day. These results enable prediction of DDT levels in non-feeding copepods if the concentration of DDT in sea water is known. (Katz)
W77-10249

MICROORGANISMS OXIDIZING PETROLEUM AND PETROLEUM PRODUCTS IN THE PRESENCE OF HIGHER AQUATIC PLANTS, (IN RUSSIAN),
Northern Research Inst. of Hydraulic Engineering and Land Reclamation, Kazan (USSR). Dept. of Hydrology and Water Resources.
N. V. Morozov, and A. V. Torpishcheva.
Gidrobiol Zh. 9(4), p 66-73, 1973.

Descriptors: *Microorganisms, Oil wastes, Oil pollution, Aquatic plants, *Bacteria, *Microbial degradation, Pseudomonas, Oxidation.
Identifiers: Achromobacter, Bacillus, Bacterium, Chromobacterium, Micrococcus, Planosarcina, Sarcina, Scirpus lacustris, Typha-angustifolia, Typha-latifolia, *Macrophytes, *Oil-oxidizing bacteria.

The presence of macrophytes promotes an increase of the number of oil-oxidizing bacteria and doubles and triples the bacterial decomposition of oil. A determination of the species composition of bacteria participating in the breakdown of oil and its products in water in the presence of higher aquatic plants showed that the qualitative composition is represented by the genera Bacillus, Bacterium, Achromobacter, Pseudomonas, Chromobacterium, Micrococcus, Sarcina and Planosarcina. In experiments with plants the 1st 3 genera dominated quantitatively: Bacillus and Bacterium accounted for 69% in the experiment with Scirpus lacustris, Bacillus for 71% with Typha angustifolia and Achromobacter for 90% with Typha latifolia. The bacteria accompanying Sc. lacustris demonstrated maximum activity with respect to the oxidation of hydrocarbons.--Copyright 1974, Biological Abstracts, Inc.
W77-10250

TOXICITY OF DISTILLERY WASTES TO PUNTIUS SOPHORE (HAM.) AND MYSTUS VITTATUS (BLOCH) (PISCES, CYPRINIDAE, BAGRIDAE) PART 3: BIOASSAY STUDIES AND TLM DETERMINATION,
D. A. V. Coll., Muzaffarnagar (India). Dept. of Zoology.
S. R. Verma, and R. C. Dalela.
Acta hydrochomica et hydrobiologica, Vol 4, No 6, p 547-556, 1976. 5 tab, 4 fig, 14 ref.

Descriptors: *Toxicity, *Turbidity, Water pollution effects, *Water temperature, *Bioassay, *Fish behavior, *Mortality, *Lethal limit, Industrial wastes, Environmental effects, Laboratory tests, Stress, Acidity, Biochemical oxygen demand, Freshwater fish, Suspended solids.
Identifiers: *Pontius, *Mystus, *Distellery waste.

The toxicity of the distillation wastes with low acidity, high turbidity, and high organic load to the two fish species is tested by a laboratory test. The threshold value of toxicity is found at a 4 or 7 per cent dilution of wastewater. The statistical analysis of the survival rates has shown that the survival rates are significantly dependent on concentration and the time of exposure, for Puntius sophore also on temperature within the range of 20--34C. Mystus vittatus proves to be the significantly more resistant species. The maximum permissible concentration of the waste in the water is calculated too. (Katz)
W77-10251

THE ECOLOGY OF EELGRASS, ZOSTERA MARINA (L.), FISH COMMUNITIES. II. FUNCTIONAL ANALYSIS,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
S. M. Adams.
Journal of Experimental Marine Biology and Ecology, Vol 22, p 293-311, 1976. 6 tab, 3 fig, 42 ref.

Descriptors: *Respiration, *Productivity, *Biological communities, *Habitats, *Ecosystems, *Fish populations, *Energy conversion, Estuaries, Aquatic productivity, Energy dissipation, Metabolism, Shallow water.
Identifiers: *Phillips Island(North Carolina), *Bogue Sound(North Carolina), *Eelgrass, *Finfish, *Zostera.

Consumption, production, and respiration of fish communities utilizing two eelgrass beds in a shallow estuarine system near Beaufort, North Carolina, have been estimated for 1971-1972: annual production was 21.7 kcal/square meter in each bed with fish accounting for 45 and 68% of the production in the Phillips Island and Bogue Sound beds, respectively. Annual community respiration was 57.9 and 69.7 kcal/square meter in the two beds with fish counting for 62.6 and 26.7% of the total in the Bogue Sound and Phillips Island beds, respectively. Estimation of the annual food energy consumed by the eelgrass fish community using the Winberg and daily ration methods gave values within 6% of each other. Energy turnover was high, and the efficiency of energy dissipation was low for the two eelgrass fish communities, suggesting that the resident fish populations were adapted to the temperature extremes within the beds. High ecological efficiencies of 0.24 and 0.23 and the high overall efficiency of the eelgrass system (Production/solar radiation) of 0.0051 and 0.-0086% indicate that the eel-grass beds are efficient systems for converting consumed energy and solar radiation into fish. (Katz)
W77-10252

MERCURY IN AQUATIC ORGANISMS. II. MERCURY DISTRIBUTION IN MUSCLES OF TUNAS AND SWORDFISH, (IN JAPANESE),
For primary bibliographic entry see Field 5A.
W77-10253

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS-III, EFFECTS OF OIL-SPILL EMULSIFIERS AND SURFACTANTS ON THE GROWTH OF PORPHYRA-LAVER, (IN JAPANESE),
Tokyo Univ. (Japan). Dept. of Fisheries.
H. Tokuda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43 (5), p 587-593, 1977. 2 tab, 5 fig, 5 ref.

Descriptors: *Oil, *Oil pollution, *Oil spills, *Surfactant, Water pollution effects, *Marine algae, *Emulsifiers, Laboratory tests, Bioassay, *Toxicity, Environmental effects, Plant diseases, Plant growth, Plant population, Plant tissues.
Identifiers: *Laver, Porphyra, *Oil-spill emulsifier, *Non-ionic surfactant, *Ester-type surfactant, Absorption spectrum.

The inhibitory effects of oil-spill emulsifiers (6 products) and non-ionic surfactants (4 products) on the growth of a laver, Porphyra yezoensis, were investigated by culture experiments. One oil-spill emulsifier composed of n-paraffin and ester-type non-ionic surfactants was so low in toxicity that its 1 ppm solution supported a layer growth rate nearly similar to that of the control, and even its 100 ppm solution exhibited a growth rate higher than 50% of the control. Polyoxyethylene (20 mole) sorbitan trioleate, an ester-type surfactant, was the least toxic of the surfactants tested and allowed the layer to grow even at the concentration of 100 ppm, while polyoxyethylene (5 mole) nonyliphenol ether was the most toxic of the ether-type surfactants used and the laver was killed within 24 hours in its 10 ppm solution. The absorption spectrum of the laver frond was not affected by a 20 hour immersion in a 1000 ppm solution of either polyoxyethylene (2 mole) oleyl ether or polyoxyethylene (20 mole) sorbitan trioleate. Changes in the cellular appearance of the laver induced by immersion in surfactant solutions prepared at various concentration were also studied by means of optimal microscopy. (Katz)
W77-10254

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-IX, ISOLATION AND IDENTIFICATION OF PENTACHLOROPHENYL-B-GLUCORONIDE ACCUMULATED IN BILE OF GOLDFISH,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
K. Kobayashi, S. Kimura, and E. Shimizu.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43(5), p 601-607, 1977. 1 tab, 4 fig, 18 ref.

Descriptors: *Freshwater fish, *Herbicides, Animal metabolism, *Fish physiology, Animal pathology, Animal physiology, *Biochemistry, Laboratory methods, Methodology, Gas chromatography, *Metabolism, Bioassay, Pollutant identification.
Identifiers: *Goldfish, *Pentachlorophenol-, PCP, Conjugated PCP, *Bioaccumulation, *Chlorophenols, *Detoxification, Fish metabolism.

A conjugated-PCP was found in the bile of goldfish, Carassius auratus after 5-hr exposure to PCP (0.1 ppm). The biliary concentration of the conjugated-PCP increased with exposure time and reached a level of 4.46 micromoles/g, corresponding to a concentration factor of 12000 at 48-hr. The conjugate was isolated by treating the bile with activated charcoal columns, followed by elution with an acetone-ammonia mixture, finally passing the

concentrated eluate through a Sephadex G-10 column. The isolated conjugate was identified as pentachlorophenyl-B-glucuronide by hydrolysis on incubation with B-glucuronidase, and by thin-layer and gas-liquid chromatography, and by determination of the molar ratio of PCP to glucuronic acid. No other conjugates including the sulfate conjugate were detected in the bile. (Katz)
W77-10255

HEAVY METALS IN THE GASTROPOD MOLLUSC HALIOTIS TUBERCULATA (L.),
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, G. W. Potts, and G. R. Forster.
Journal of Marine Biological Association of the United Kingdom, Vol 57, 1977, p 379-390, 4 tab, 2 fig, 13 ref.

Descriptors: Metals, Mollusks, Gastropods, Marine animals, Silver, Aluminum, Calcium, Cadmium, Cobalt, Chromium, Copper, Iron, Magnesium, Manganese, Nickel, Lead, Zinc, Path of pollutants, *Heavy metals, Pollutant identification.
Identifiers: Abalone, Haliotis, *Marine gastropods, *Bioaccumulation, *Tissue concentration, Channel Islands.

The concentrations of 13 metals (Ag, Al, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Zn) have been measured in the whole soft parts, foot, viscera and individual tissues of the gastropod mollusc Haliotis tuberculata (.). In the edible foot, concentrations of most metals fell with increasing size but in the inedible viscera concentrations of cadmium, silver and copper increased. The viscera accounted for about 26% of the dry weight of the soft parts and contained more than 50% of all metals except nickel and 90% or more of cadmium, iron and cobalt. Analyses of the tissues showed that the highest levels of copper were found in the blood (haemocyanin) and in the left kidney. High levels of nickel were associated with surface tissues such as the mantle and epidermis of the foot, a similar situation to that observed in H. rufescens by Anderlini (1974). The highest concentrations of other metals were found in the digestive gland or the right kidney which seems to be functionally different from the left. A close correlation between concentrations of iron ad cobalt was observed in the viscera. Concentrations of calcium, magnesium and manganese were related in the digestive gland and this appears to result from their inclusion in what Crofts (1929) described as 'chalk' granules. A lack of variability in the results for zinc tends to confirm the contention by Anderlini that zinc is regulated in Haliotis. (Katz)
W77-10256

HEALTH AND ECOLOGICAL ASPECTS OF COBALT-60 TRANSFER IN SEAWATER FOOD CHAIN TYPICAL OF AN INTERTIDAL MUDFLAT,
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de Radioecologie.
J. C. Amiard, and C. Amiard-Triquet.
International Journal of Environmental Studies, Vol 10, 1977. p 113-118, 3 tab, 1 fig, 12 ref.

Descriptors: *Metals, *Cobalt, *Marine algae, *Marine animals, Marine biology, Laboratory tests, *Radioactive wastes, Radioactivity effects, Radioisotopes, *Food chains, Path of pollutants, Water pollution effects, Public health, Littoral, Mud flats.
Identifiers: *Radionuclides, *Cobalt-60, *Cobalt 60-transfer, Marine trophic chain.

The assimilation and subsequent elimination of cobalt-60 by different marine organisms are affected by the mode of contamination: chronic or acute. Experimental cobalt-60 contamination of such organisms varies qualitatively and quantitatively according to whether the pollutant is transferred through the water or through the food. The concentration factor with respect to water, the transfer factor through food and the overall contamination estimate show a decrease for the highest trophic levels. (Katz)
W77-10257

CRITICAL THERMAL MAXIMA OF TWO SPECIES OF ESTUARINE FISH,
Environmental Research Lab., Narragansett, R.I.
D. Everich, and J. G. Gonzalez.
Marine Biology, Vol 41, 1966. p 141-145, 1 tab, 1 fig, 20 ref.

Descriptors: *Bioassay, *Mortality, Laboratory tests, Marine fish, Estuarine environment, *Thermal water, Water temperature, Methodology, Rhode Island, Aquaria, Laboratory equipment, Bottom fish, Water pollution effects, *Thermal pollution, *Thermal stress, Pollutant identification.
Identifiers: Winter flounder, Pseudopleuronectes, Scup, Stenotomus, *Critical thermal maxima(CTM), *Acclimation, Estuarine fish.

Critical thermal maxima (CTM) were determined for winter flounder (Pseudopleuronectes americanus, Walbaum) and scup (Stenotomus chrysops, L.), acclimated to ambient water temperature or constant increments above ambient. The acclimation regimes simulated a natural environment by tracking the temperature fluctuations in Point Judith Pond, a small Rhode Island estuary. An elevation in CTM from 30.2 to 35.6C was observed for scup as the mean acclimation temperature increased from 14.8 to 22.2C. CTM for flounder increased from 26.4 to 32.4C over an accilimation range of 4.2 to 23.0C. The use of CTM studies for predicting the effects of heated effluents is discussed. (Katz)
W77-10258

POLYCHLORINATED BIPHENYLS IN COASTAL MARINE ZOOPLANKTON: BIOACCUMULATION BY EQUILIBRIUM PARTITIONING,
Washington Univ., Seattle. Dept. of Oceanography.
J. R. Clayton, S. P. Pavlou, and N. F. Breitner.
Environmental Science and Technology, Vol 11(7), July 1977. p 676-682, 4 tab, 5 fig, 43 ref.

Descriptors: *Aroclor, *Chlorinated hydrocarbon pesticides, *Polychlorinated biphenyls, *Zooplankton, Estuaries, Pacific Ocean, *Lipids, Sea-water, Biological membranes, Water pollution effects, *Path of pollutants, *Food chains, Marine animals, Trophic levels.
Identifiers: *Bioaccumulation, *Biomagnification, *Residue levels, North Eastern Pacific Ocean, Lipid concentration, *Equilibrium partitioning, Amplification factors, Pelagic biota.

Chlorobiphenyl concentrations in marine zooplankton from estuarine zones of the North Eastern Pacific Ocean were measured from 1973 through 1975. Concentrations in the lipid fraction of the organisms ranged between 1 and 16 ppm. For the low levels detected in seawater (0.7-3.4 ppt), the data suggest that bioaccumulation is predominantly controlled by equilibrium partitioning of the chemical between the internal lipid pools of the biota and ambient water. Amplification factors of 10 to the sixth power are determined in terms of lipid water concentration ratios, k sub 1 to the Nth power. These quantities are uniform over a wide range of spatial and temporal regimes, species composition, and lipid content of the organisms. The results from this study provide good evidence that at least for pelagic biota at the lower trophic levels, food chain biomagnification is not a controlling factor in attaining the observed residue levels. (Katz)
W77-10259

SHORT-TERM EFFECTS OF HIGHWAY CONSTRUCTION ON THE LIMNOLOGY OF A SMALL STREAM IN SOUTHERN ONTARIO,
Guelph Univ. (Ontario). Dept. of Zoology.
B. A. Barton.
Freshwater Biology Vol. 7(2), p April, 1977, p. 99-108, 4 tab, 3 fig, 42 ref.

Descriptors: *Streams, Limnology, *Highway effects, *Highway relocation, Highway, *Road construction, *Sediments, Suspended solids, Water pollution effects, *Channeling, Water quality, Fish populations, Benthos, Invertebrates, On-site investigations, Sampling, *Canada.
Identifiers: *Species composition, *Standing fish crop, *Southern Ontario.

A limnological investigation was carried out to document the effects of constructing a modern highway across a small stream in southern Ontario. During construction, suspended solids increased to as high as 1390 mg/l but later returned to pre-construction levels of <5 mg/1. Similarly, sediment deposition increased ten-fold to 0.61 g dry wt/cm2 day directly below the construction site during stream rechannelization after completion of the culvert. Decreased proportion of organic matter in sediments indicated that they came from the construction site. Sediments were readily removed by spates and apparently settled out in downstream ponds. There was no change in water chemistry. Standing crop of fish was reduced from 24 to 10 kg/ha immediately below the site. This decrease did not occur further downstream and fish populations at the affected site returned to original levels after construction. However, there was a noticeable shift in species composition. Invertebrates present during construction activities may have remained in sheltered areas avoiding sedimentation effects. Evidence from invertebrate sampling in denuded areas around the site strongly suggests that organisms which may have been removed during construction were replaced quickly by drift. (Katz)
W77-10260

COPPER TOXICITY EXPERIMENTS IN RELATION TO ABALONE DEATHS OBSERVED IN A POWER PLANT'S COOLING WATERS,
California State Dept. of Fish and Game, Monterey. Marine Bioassay Lab.
M. Martin, and M. D. Stephenson.
California Fish and Game, Vol. 63(2), 1977, p. 95-100, 3 tab, 10 ref.

Descriptors: *Metals, *Copper, *Toxicity, Bioassay, Mortality, *Water pollution effects, Seawater, Benthos, Mollusks, *Gastropods, *Nuclear power plants, Water quality, Cooling water, *Animal pathology, *Thermal pollution.
Identifiers: *Abalone, Haliotis, *Red abalone, *Black abalone, *Copper accumulation, Studies, Histopathology, Tissue analysis, TL50, Histopathological abnormalities.

Toxicity of copper as copper sulfate to adult and larval red abalone, Haliotis rufescens, and adult black abalone, Haliotis cracherodii, was determined by static bioassay in seawater at 14 C (57 F). Copper accumulation studies and histopathological analysis in digestive gland and gill tissues were conducted. The TL50's for adult red and black abalone were 65 ppb and 50 ppb copper, respectively. The TL50 for larval red abalone was 114 ppb copper. Copper was found to accumulate in gill tissues of red and black abalone at 56 ppb copper concentration. Histopathological abnormalities in gill tissues occur at concentrations above 32 ppb. (Katz)
W77-10261

EFFECT OF NO. 2 FIEL OIL AND SOUTH LOUISIANA CRUDE OIL WATER-SOLUBLE FRACTIONS ON HEMOGLOBIN COMPENSATION AND HYPOXIA TOLERANCE IN THE

POLYCHAETOUS ANNELID, NEANTHES ARENACEODENTATA (MOORE),
Scripps Institution of Oceanography, La Jolla, Calif. Marine Biology Research Div.
S. S. Ross, and J. W. Anderson.
Marine Science Communications, Vol. 13(2), 1977, p. 117-131, 1 tab, 1 fig, 15 ref.

Descriptors: *Oil wastes, *Oil spills, Water pollution effects, *Animal physiology, Biochemistry, Bioassay, *Toxicity, *Dissolved oxygen, *Annelids, Spectrophotometry, Laboratory tests, Oil pollution.
Identifiers: *No. 2 fuel oil, *South Louisiana crude oil, *Water-soluble fraction, Hemoglobin compensation, Hypoxia tolerance, Polychaetus annelid, Neanthes, *Naphthalenes, Total dissolved hydrocarbons, Respiratory physiology, Marine infauna.

Exposure to sublethal concentrations of No. 2 fuel oil water-soluble fractions (WSFs) did not affect the ability of Neanthes arenaceodentata to increase its body hemoglobin content in response to hypoxia. Similar treatment using water-soluble fractions of South Louisiana crude oil likewise indicated little disruption of compensatory ability. Reduced dissolved oxygen (D.O.) concentrations did not significantly alter the toxicity of No. 2 Fuel Oil WSFs to N. arenaceodentata. Low D. O. concentrations markedly increased the toxicity of So. La. crude oil WSFs, producing a synergistic effect. Results were defined relative to the concentration of naphthalenes and total dissolved hydrocarbons in experimental media. Possible effects of petroleum hydrocarbons on the respiratory physiology of marine infauna were briefly considered. (Katz)
W77-10262

NITRIFICATION POTENTIAL OF RIVER ENVIRONMENTS,
Rutgers - The State Univ., New Brunswick, N. J. Dept. of Environmental Science.
M. S. Finstein, and V. A. Matulewich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 782, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, Rutgers Water Resources Research Institute, May 1977. 49 p, 16 fig, 7 tab, 8 ref. OWRT A-039-NJ(2), 14-31-0001-5030.

Descriptors: *Nitrification, Nitrogen cycle, Waste assimilative capacity, Rivers, Biochemical oxygen demand, *New Jersey, Outfall sewers, Water pollution sources, Ammonium.
Identifiers: *Nitrogenous biochemical oxygen demand, Microbial ecology, Waste load allocation, Sessile nitrifying populations, Streambed habitat.

Evidence from field and laboratory studies indicates that the NH+4 discharged to Mine Brook, N.J., is nitrified by organisms associated with the streambed within 2.2 mi (approx 5.5 hr) travel from the outfall. During a period in which steady-state conditions were approached, the NH+4-N load just below the outfall was 256 mg/sec, and 8 mg/sec at the terminal station. The number of nitrifying bacteria in the water phase was insignificant compared to those associated with streambed rocks and sediment. Only about 1/3 of the NH+4-N that disappeared in the Brook was accounted for as NO-w-N+NO3-N. In laboratory trials involving rocks but not sediment or deeper streambed levels, all of the NH+4-N that disappeared was recovered as NO-3-N. In these trials nitrification commenced more quickly as the samples represented greater distance from the outfall. Commencement was much faster in the presence of rocks than in their absence. Ammonium started to disappear immediately when contacted to rocks from all stations downstream of the outfall. For No-2 this was true only with rocks from the more distant stations. Up to 45 days storage of rocks in unamended Brook water had little effect on the course of NH+4-N disappearence. Although the slow growth of nitrifying bacteria relative to heterotrophs might be expected to delay the nitrification of effluent NH+4, no such delay occurs in the mine Brook because the responsible organisms are pre-grown on streambed surfaces.
W77-10265

STUDIES ON THE NATURAL RELATIONSHIPS OF CYANOPHAGES AND THEIR HOSTS AND THE NATURE OF RESISTANCE,
Livingston Coll., New Brunswick, N. J. Dept. of Biology.
F. G. Jenifer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 781, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Water Resources Research Institute, New Brunswick, N.J., June 1977. 24 p, 4 tab, 6 fig, 15 ref. OWRT A-040-NJ(1), 14-31-0001-5030.

Descriptors: *Cyanophta, *Eutrophication, *Algal control, *Biocontrol, *Selectivity, Aquatic algae, Viruses, Resistance, *New Jersey, Drainage basins.
Identifiers: *Cyanophages, Lipopolysaccharide, Raritan River basin(NJ), Plectonema boryanum, Anacystis nidulans.

The cyanophages LPP-1 and/or LPP-2 were isolated from 19 natural water bodies of the Raritan River drainage basin in New Jersey. The seasonal fluctuations of LPP-1 and LPP-2, and Plectonema and 13 others genera of blue-green algae were monitored for the first time in the same water system. There is a direct relationship between the occurrence of the LPP cyanophage group and Plectonema boryanum. This finding suggests that the LPP cyanophages may play a role in the natural control of Plaectonema boryanum and are of potential use as biological controls for this alga. Studies on the AS-1/Anacystis nidulans system clearly indicate that mutants of A. nidulans resistant for AS-1 rapidly develop during AS-1 infection. AS-1 is unable to attach to the surface of these mutants. AS-1 is also irreversibly inactivated by the lipopolysaccharide (LPA) isolated from wild type A. nidulans. These results suggest that if mutants of other blue-green algae develop as rapidly under cyanophage selection pressure as is the case in A. nidulans and if the nature of their resistance is similar, then the use of cyanophages as specific biological controls seems of dubious value.
W77-10266

EXPERIMENTAL STUDIES ON CHANGING ALGAL POPULATIONS FROM BLUE-GREENS TO GREENS,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 5G.
W77-10269

THE EFFECT OF FIRE ON THE CALIFORNIA CHAPARRAL VEGETATION,
Academia Sinica, Taipei (Taiwan). Inst. of Botany.
C.-H. Chou.
Bot Bull Acad Sin (Taipei). 14(1), p 23-34, 1973.

Descriptors: *Chapparral, Vegetation, *California, *Succession, *Burning, Rainfall, Temperature, Herbicides, Toxins, Toxicity, Plant growth.
Identifiers: Arctostaphylos, *Herbaceous plants, *Phytotoxins.

Fire is a very important ecological factor in determining the succession of the California chapparral vegetation. It occurs frequently in the 'Mediterranean region' of southern California. The luxuriant growth of herbaceous plants appear in the 1st growing season after a fire. However, a high toxicity is found in the burned land. The quantitative comparison of phytotoxins in the herb, shrub and burned soil was determined. It was found that the phytotoxins in the herb, shrub and burned soil was determined. It was found that the phytotoxin in the burned soil is much higher than that in the herb and shrub soils. However, the toxicity of burned soil is tremendously decreased after a sequence of rainfalls. The toxicity of the aqueous extract of Arctostaphylos leaf litter, heated by a series of temperatures from 60-240C with 20C interval, reaches its maximum peak at 160C, and the toxicity then decreased greatly at temperatures above 180C and was totally lost at 200C. The toxin distribution in the treated leaf litter agrees with this bioassay result. Phytotoxins in the burned soil are water soluble and can be leached out by rainfall. Apparently fire plays a significant role in enhancing the leachability of toxins by rain.--Copyright 1974, Biological Abstracts, Inc.
W77-10324

EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH - II, RESULTS OF MORPHOLOGICAL EXAMINATION, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
J. Koyama, and Y. Itazawa.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 43(5), p 527-533 (1977), 1 tab, 2 fig, 11 ref.

Descriptors: *Cadmium, Metals, *Toxicity, Bioassay, *Animal pathology, *Fish diseases, Growth, Feeds, Feeding rates, Laboratory tests, Water pollution effects, *Path of pollutants, *Biochemistry, Metabolism, Methodology.
Identifiers: *Tissue changes, Weight gain, *Histological observations, Kidney, Hepatopancreas, *Vertebral column.

Weight gain and hepato-somatic index decreased depending on the Cd content of the feed in most experiments. Lateral curvature of the vertebral column by lateral bending of a/a few centrum/centra was observed in the fish (14% of 93 individuals in fish administered with Cd > 140 ppm) that had exhibited violent swimming and tetany during the experiment. In Cd administered fish, abnormal black granules which accumulated around blood vessels were observed in the liver, and degeneration (thin walls) of proximal renal tubules and cells that seemed to have lost the protoplasm were observed in the kidney. A possible mechanism for the lateral curvature of the vertebral column may be conjectured as follows: disturbance of the balance between Ca and inorganic P in the plasma caused by degeneration of renal tubules attributable to orally administered Cd leading to low Ca and high inorganic P levels of the plasma as well as low Ca content of vertebrae leading to hyperexcitability of the nervous system and muscles leading to violent swimming and tetany leading to lateral bending of a/a a few centrum/centra leading to lateral curvature of the vertebral column. (Katz)
W77-10361

GROWTH OF AN ESTUARINE PSEUDOMONAS SP. ON POLYCHLORINATED BIPHENYL,
Maryland Univ., College Park. Dept. of Microbiology.
G. S. Sayler, M. Shon, and R. R. Colwell.
Microbial Ecology 3, p 241-255, 1977, 2 tab, 6 fig, 21 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, Bacteria, *Marine bacteria, *Biodegradation, Biological treatment, *Food chains, Estuaries, Estuarine environment, Methodology, Biochemistry, *Pseudomonas, Laboratory tests, Analytical methods, Radioactivity techniques, Pollutant identification.
Identifiers: *Aroclor 1254, *PCB, PCB residues, *Bioaccumulation.

In the course of a study of the microbial degradation of polychlorinated biphenyls (PCB), 16 cultures, representing 5 genera of bacteria, were isolated. A Pseudomonas sp. was found to degrade mixtures of PCB (Aroclor 1254) and pure isomers, i.e., hexachlorobiphenyl (HCB). Degradation was variable, depending on length of incubation, purity, and degree of chlorination of the biphenyl molecule. In addition to apparent degradation of PCB, it was observed that PCB stimulated growth and oxygen uptake. Bioaccumulation of PCB residues was suggested, since 11C-labeled material derived from 11C-PBC by microorganisms indicates this may be an important mechanism for removal or mobilization of PCB into food chains in the estuarine environment. (Katz)
W77-10362

THE FISH COMMUNITY IN A SECTION OF ROKYTNA CREEK AFTER TWENTY YEARS,
Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu.
J. Libosvarsky.
Folia Zoologica, Vol 26(1), 1977, p 57-60, 2 tab, 5 ref.

Descriptors: *Freshwater fish, *Environment, *Streams, Minnows, Animal grouping, *Animal populations, Fish types, Fishing gear, Sampling, *Eutrophication, Environmental effects, Electrofishing.
Identifiers: *Czechoslovakia, *Species composition, *Species fluctuation, *Rokytna Creek(Czeck), Chub, Barb, Gudgeon, Leuciscus, Barbus, Bogio, Chondrostoma.

Two bags of fish sampled by means of electrofishing are compared. They were collected in a section of the Rokytna Creek during two different decades (1956 and 1974 to 1976). While the number of fish species living in the section obviously did not change, the proportions of the species caught were different. The chub (Leuciscus cephalus) prevailed by far in the community in the seventies. The share of the barb (Barbus barbus) increased, while the occurrence of the gudgeon(Gobio gobio) and Chondrostoma nasus decreased. The changes may be also relative to some environmental effects in the stream, such as lower polymorphism or the stream bed, lower water discharge in the recent years and the progressive eutrophication of the water through nutrients from the farmland. (Katz)
W77-10363

INFLUENCES ON THE CARBON DIOXIDE BALANCE OF SUBMERSED HIGHER AQUATIC PLANTS IN FLOWING WATER BY NOXIOUS SUBSTANCES CONTAINED IN WATER, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
W. Horbach, L. Hornig, and G. Weise.
Acta Hydrochimica et Hydrobiologica Vol. 14(4), 1976, p. 363-384, 12 tab, 9 fig, 8 ref.

Descriptors: Water quality, *Carbon dioxide, *Nickel, *Zinc, *Copper, Metals, *Algae, Aquatic plants, Aquatic environment, On-site investigation, Plant physiology, *Plant growth, *Photosynthesis, *Metabolism, Aquatic productivity, *Submerged plants, Water pollution effects.
Identifiers: *Zwickauer-Mulde River, *CO2 bond, Respiratory CO2-release, Oxygen consumption, Submerged macrophytes, Potamogeton, *Pondweed, Amblystegium.

Under water-ecological conditions investigations are described for the gas-metabolism physiological behavior of the submersed macrophytes Potamogeton pectinatus (pondweed) and Amblystegium riparium on the basis of the IRGA measurement technique by means of a mobile laboratory. Both species predominate in a selected flow section of the Zwickauer Mulde river. Experimentally determined rates of decrease of assimilation for the heavy metals, Ni2+, Zn2+ and Cu2+ allow the prediction of matter balance values when the corresponding heavy metal loads are present, since the photosynthetic CO2-bond with O2-liberation and the respiratory CO2-release are correlated with the oxygen consumption in the water analyzed. (Katz)
W77-10364

THE EFFECTS OF ORGANIC POLLUTION ON BENTHIC ORGANISMS NEAR MARSEILLE,
Durham Univ. (England). Dept. of Botany.
B. P. Jupp.
International Journal of Environmental Studies, Vol. 10, p. 119-123, 1977, 4 tab, 8 ref.

Descriptors: On-site investigations, *Benthos, *Water pollution effects, *Marine algae, *Organic wastes, *Detergents, Littoral, *Sewage, Shallow water, Marine animals, *Sewage effluents.
Identifiers: *Mediterranean(Gulf of Marseilles), *Marseille(France), *Sea grass, Sublittoral organisms, Rocky substrates, Posidonia, *Sea urchins, Echinoids, Organic pollution.

A quantitative survey of sublittoral marine organisms was carried out in polluted and unpolluted waters near Marseille (France). Samples from rocky substrates indicate that organic pollution effects have not decreased since earlier surveys. Studies on beds of Posidonia oceanica, the dominant Mediterranean sea grass, show that its biomass is low in the polluted Gulf of Marseille compared with that in unpolluted bays near Marseille and with data from Malta. Crops were particularly low in shallow water to 15m where it is suggested that grazing by echinoids, whose numbers are probably encouraged by high levels of organic material, could be an important factor limiting growth, as well as other factors such as low underwater irradiance and detergent toxicity. Along the most polluted coastline near the main sewer outlet at Cortiou, Posidonia was absent and is probably excluded by indirect and direct effects of the effluent. The decline of these sea grass beds has serious implications for sediment stability and the survival of associated biota. (Katz)
W77-10365

IMPACTS OF NUCLEAR RELEASES INTO THE AQUATIC ENVIRONMENT.
International Atomic Energy Agency Vienna (Austria).
Proceedings of an International Symposium on Radiological Impacts of Releases from Nuclear Facilities into Aquatic Environments held by the IAEA at Otaniemi, Finland, June 30-July 4, 1975. STI/PUB/406. 524 p, $30.00.

Descriptors: *Conferences, *Environmental effects, *Water pollution effects, *Radioactive wastes, *Aquatic environment.

The proceedings includes a total of 33 papers in the areas of behaviour of radioactive contaminants and their stable natural isotopes in aquatic systems; plutonium and other transuranium nuclides in the aquatic environment; identification of critical pathways relative to the physical, chemical and biological systems; methods of monitoring and evaluation of effects on and doses to man and aquatic biota; and factors determining the environmental capacity for receiving releases from nuclear facilities in the aquatic environment. A report of a general discussion session and an author index are included. (See W77-10385 thru W77-10417) (Chilton-ORNL)
W77-10384

THE RADIOLOGICAL CONSEQUENCES OF RELEASES FROM NUCLEAR FACILITIES TO THE AQUATIC ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England).
A. Preston.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 3-23, 6 tab, 43 ref. IAEA-SM-198/57.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, Aquatic environment, Nuclear energy, Nuclear wastes.

The paper reviews experience of the past three decades in respect to the release of radioactive materials to the environment and draws some conclusions relevant to the regulatory problem: standards of radiation exposure recommended by ICRP provide a suitable basis for regulating the introduction of material to aquatic environments; dose limits should be kept as low as achievable; application of critical path analysis techniques to impact assessments provides a suitable basis for applying and interpreting dose limits in environmental terms; protection of public health provides adequate protection for the marine ecosystem; a need exists for research efforts in respect to deep sea processes; problems posed by the introduction of long-lived transuranic elements are no different in principle to those posed by, and solved for, other radionuclides. (See also W77-10384) (Chilton-ORNL)
W77-10385

RADIOLOGICAL IMPACTS OF RELEASES FROM NUCLEAR FACILITIES INTO AQUATIC ENVIRONMENTS-USA VIEWS,
Energy Research and Development Administration, Washington, D.C. Div. of Biomedical and Environmental Research.
For primary bibliographic entry see Field 5B.
W77-10386

ETUDE DE L'INFLUENCE DU CADMIUM STABLE SUR LE TRANSFERT DU ZINX-65 EN ECOSYSTEME IRRIGUE PAR SUBMERSION (RIZIERE IRRIGUEE), (STUDY OF THE INFLUENCE OF STABLE CADMIUM ON THE TRANSFER OF ZINC-65 IN AN ECOSYSTEM IRRIGATED BY SUBMERSION (IRRIGATED RICE FIELD),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
C. Myttenaere, M. Merlini, R. Bittel, P. Dabin, and J. M. Mousny.

Descriptors: *Environmental effects, *Water pollution, *Radioisotopes, *Zinc, *Cadmium, Pollutants, Irrigation, Industrial wastes, Nuclear wastes.
Identifiers: Associate contaminants.

The interaction of a nuclear contaminant (zinc 65) and a conventional contaminant (stable cadmium) was studied under controlled mini-rice-field conditions. The water was enriched with 1 ppm stable zinc and 0.0025, 0.005, and 0.050 ppm stable cadmium. Fish were introduced into each compartment of the ecosystem and samples of irrigation water and surface were taken during cultivation and at the end of cultivation. Stable zinc, radioactive zinc, and stable cadmium were determined in each component of the ecosystem. Results justified the use of the term associate contaminant to describe the influence of a conventional contaminant on the transfer of a radionuclide. (See also W77-10384) (Chilton-ORNL)
W77-10387

ETUDE DE LA CONTAMINATION DE CONSTITUANTS DU MILIEU MARIN PAR DES FORMES SOLUBLES ET INSOLUBLES DE RADIONUCLIDES, (STUDY OF THE CONTAMINATION OF COMPONENTS OF THE MARINE ENVIRONMENT BY SOLUBLE AND INSOLUBLE FORMS OF RADIONUCLIDES),
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
A. Fraizier, and J. C. Ancellin.

In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 49-62, 8 tab, 3 fig, 9 ref. IAEA-SM-198/8.

Descriptors: *Environmental effects, *Water pollution, Pollutants, Radioisotopes, *Cesium, *Cobalt, Iron, Aquatic environment, Physicochemical properties, Animal physiology, Physiological ecology.
Identifiers: *Cerium, *Rubidium.

Cs 137, Cr 51, Co 60, Ru 106, and Fe 59 were used to clarify the relationships between the physicochemical states of the radionuclides, the variations in the environmental conditions, and the properties of the experimental samples. Marine organisms were more readily contaminated by the insoluble forms of Ru 106 and Fe 59 than they were by the soluble forms. The physiology of the organisms appeared to influence the degree and evolution of the contamination whatever the physicochemicl state of the radionuclide. In some cases, the contamination level was independent of the variations in environmental conditions and the related variations in the physiology of the organism. (See also W77-10384) (Chilton-ORNL)
W77-10388

BEHAVIOUR OF CAESIUM-137 IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Haifa (Israel). Dept. of Fisheries.
E. Gilat, Y. Laichter, and N. H. Shafrir.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 63-76, 7 tab, 2 fig, 21 ref. IAEA-SM-198/18.

Descriptors: *Environmental effects, *Water pollution, Pollutants, *Cesium, Radioisotopes, Food chains, Aquatic environment.
Identifiers: Maximum permissible concentration(Cesium).

To find the concentration and pathway of Cs 137 in the marine environment, the behaviour of Cs 137 originating from fallout was investigated. Results of the Cs 137 concentrations obtained for surface waters and for a number of profiles down to a depth of 1000 m showed variations by a factor of ten (0.65-0.07), maximum concentrations being found at a depth of 100-300 m. Cs 137 concentrations in marine biota representing a food chain of benthic algae, invertebrates and fish were determined. Results showed concentration factor values within the range of 10-300 in all three groups. A concentration factor for Cs 137 in sediment samples of approximately 200 was found. Using a value of 150 for the most common edible link of the food chain as an upper limit for Cs 137 concentration factor, a reduction of the recommended maximum permissible concentration value in sea water is suggested. (See also W77-10384) (Chilton-ORNL)
W77-10389

STUDIES ON RARE EARTH ELEMENTS IN SEAWATER AND UPTAKE BY MARINE ORGANISMS,
National Inst. of Radiological Sciences, Chiba (Japan).
H. Suzuki, T. Koyanagi, and M. Saiki.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 77-91, 4 tab, 5 fig, 15 ref. IAEA-SM-198/19.

Descriptors: *Environmental effects, *Sea water, *Radioactive wastes, Path of pollutants, *Absorption.
Identifiers: Bioaccumulation, *Rare earth elements, *Cerium, *Europium, *Terbium.

Seawater and certain marine organisms were analyzed for determination of rare earth elements. Some of the seawater was treated with HCl before filtration (prior to analysis) and some after filtration. Concentrations of the rare earth elements acidified with HCl after filtration were slightly lower than those acidified before filtration. It was concluded that concentration factors are affected by the existing state of the elements in the seawater. If only the dissolved state is assumed available for marine organisms, values about one order of magnitude higher are obtained, especially for cerium, europium, and terbium. The higher values of concentration factor should be used when studying bioaccumulation of rare earth elements at points near to the discharge point of radioactive liquid wastes. (See also W77-10384) (Chilton-ORNL)
W77-10390

A TRACE ELEMENT STUDY IN THE THAMES ESTUARY,
Royal Naval Coll., Greenwich, London (England). Dept. of Nuclear Science and Technology.
C. D. Bevan, S. A. Harbison, L. A. Nelson, and J. R. Lakey.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 93-106, 5 tab, 1 fig, 19 ref. IAEA-SM-198/30.

Descriptors: *Environmental effects, *Water pollution, Pollutants, Suspended load, Suspension, Aqueous solutions, Sediments, *Trace elements.

Concentration of trace elements in the dissolved fraction and the non-dissolved fraction of the water and in sediments from part of the Thames Estuary is reported. Six groups of elements were identified with correlations indicating relationships within each group. Ten elements were identified in the suspended particulate fraction including iron. Cerium, chromium and thorium were on the same level in the suspended particulate fraction as in muddy deposits but cobalt, cesium, europium and scandium were enriched in the suspended particulate fractions. Hafnium was at a higher concentration in the sediments. In general, concentrations were lower in sandy deposits than in muddy deposits but with insignificant differences for iron and cobalt. (See also W77-10384) (Chilton-ORNL)
W77-10391

ENVIRONMENTAL BEHAVIOUR OF THE BINUCLEAR OXYGEN-BRIDGED NITRATONITROSYLRUTHENIUM COMPLEX,
Japan Atomic Energy Research Inst., Osaka; and Kinki Univ., Osaka (Japan).
Y. Nishiwaki, Y. Honda, Y. Kimura, T. Ishiyama, and T. Matsumura.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 107-120, 6 fig, 3 tab, 36 ref. IAEA-SM-198/45.

Descriptors: *Environmental effects, *Aquatic environments, Chemical analysis, Radioactive wastes.
Identifiers: *Ruthenium.

The technique used in this investigation were filter paper electrophoresis, paper chromatography, and infrared absorption spectra of a decomposition product in fresh water. Filter paper electrophoresis resulted in the complex being fractionated into at least four anionic species, one neutral species and one cationic species. After one day's aging, the anionic fraction increased and reached 75% of total Ru. Paper chromatographic determination of (Ru-O-Ru) nitrate complex species showed that about 90% of total Ru in the fresh water environment was taken up in the fraction with flow rate R sub f less than 0.2, corresponding to the anionic mononitro-, mononitratonitrosyl and uncomplexed species. Infrared studies were undertaken to verify the results obtained by paper chromatography. (See also W77-10384) (Chilton-ORNL)
W77-10392

LE TRANSFERT DU ZINC-65 DE SEDIMENTS A DES LARVES DE CHIRONOMIDES ET A UN POISSON D'EAU DOUCE ET L'EFFET DU CADMIUM SUR CE TRANSFERT, (TRANSFER OF ZINC-65 FROM SEDIMENTS TO CHIRONOMID LARVAE AND TO A FRESHWATER FISH AND THE EFFECT OF CADMIUM ON TRANSFER),
Commission of the European Communities, Ispra (Italy). Joint Research Centre.
A. R. Berg, and G. M. Weiss.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 121-132, 3 fig, 2 tab, 13 ref. IAEA-SM-198/47.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutants, *Zinc, *Cadmium, Sediments, Larvae, Fish, Diptera.

Chironomid larvae were reared on a sediment rich in organic matter, in cadmium concentrations of 0, 10, and 20 ppm. The larvae were then fed to Haplochromis buttoni which were kept in water at the same cadmium concentrations. Transfer of zinc and cadmium through the chain (sediments-water-larvae-fish) was traced and the results showed that cadmium strongly inhibited the exchange of zinc for the larvae but this inhibition was not apparent in the case of the fish in the concentrations of cadmium studied. The equilibration time for the accumulation of radiozinc by fish is very long but cadmium accumulation reaches equilibrium in 5-7 days. Excretion of accumulated cadmium was found to take place at a relatively slow rate. (See also W77-10384) (Chilton-ORNL)
W77-10393

THE BEHAVIOUR OF SR90 AND CS137 IN THE WATERS OF THE BALTIC SEA,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow.
For primary bibliographic entry see Field 5B.
W77-10394

PLUTONIUM ISOTOPES IN AQUATIC FOODCHAINS IN THE BALTIC SEA,
Helsinki Univ., (Finland). Dept. of Radiochemistry.
J. K. Miettinen, T. Jaakkola, and M. Jarvinen.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 147-155, 2 tab, 1 fig, 9 ref. IAEA-SM-198/10. CH E(11-1)-3011.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutants, Radioisotopes, *Plutonium, Food chains, Aquatic environment.
Identifiers: *Baltic Sea.

The study was undertaken to establish a base line for plutonium concentration in biota of the Baltic Sea to be used for comparison of changes which may occur when nuclear power plants presently under construction come into operation. Sea water, bottom sediment, algae, benthic fauna, and fish samples were analyzed. Fish (ruff, flounder, cod) contain 0.04-0.14 pCi (Pu239 and Pu240)/kg fresh wt., blue mussel 0.6 pCi/kg fresh wt., brown alga 5 pCi/kg fresh wt. and sediment 0.18 nCi/kg in the top centimeter. The Pu 239, 240 level in samples are comparable with those from the Great Lakes. The food chains seem to lead to reduction in Pu levels. The values from sediment and mussel in the Baltic were twice as high as those from the North Atlantic. (See also W77-10384) (Chilton-ORNL)
W77-10395

EXPERIMENTAL STUDIES ON PLUTONIUM KINETICS IN MARINE BIOTA,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10396

ADSORPTION-DESORPTION CHARACTERISTICS OF PLUTONIUM AND AMERICIUM WITH SEDIMENT PARTICLES IN THE ESTUARINE ENVIRONMENT, STUDIES USING PLUTONIUM-237 AND AMERICIUM-241,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5B.
W77-10397

SOME INVESTIGATIONS INTO THE BEHAVIOR OF PLUTONIUM IN THE MARINE ENVIRONMENT,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
J. A. Hetherington, D. F. Jefferies, and M. B. Lovett.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 193-212, 6 fig, 6 tab, 19 ref. IAEA-SM-198/29.

Descriptors: *Environmental effects, *Water pollution, *Path of pollutant, Radioisotopes, *Plutonium, Cesium, Sedimentation, Sediments.

A preliminary survey of the behaviour of Pu239 discharged from Windscale to the Irish Sea showed that a large fraction of the plutonium discharged is lost rapidly from the water phase and that the residual amount behaves thereafter conservatively and in a similar fashion to Cs137. Measurements of Pu239 in seabed sediment showed no accumulation in the vicinity of the outfall and it was concluded that once the plutonium is lost from the water it is dispersed in association with the general sediment transport processes in the area. A similarity between Pu239 and Cs137 distributions with depth in core samples was noted and it was suggested that this implies that sedimentation is the primary mechanism by which these nuclides are incorporated into the sediments. (See also W77-10384) (Chilton-ORNL)
W77-10398

PLUTONIUM IN THE AQUATIC ENVIRONMENT AROUND THE ROCKY FLATS FACILITY,
Dow Chemical Co, Golden, Colo. Rocky Flats Div.
For primary bibliographic entry see Field 5B.
W77-10399

THE BEHAVIOUR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, I. BIOLOGICAL TRANSPORT, SEASONAL CYCLING, AND RESIDENCE TIMES IN THE WATER COLUMN,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10400

THE BEHAVIOR OF PLUTONIUM AND OTHER LONG-LIVED RADIONUCLIDES IN LAKE MICHIGAN, II. PATTERNS OF DEPOSITION IN THE SEDIMENTS,
Argonne National Lab., Ill. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W77-10401

CONSEQUENCES DU DEPLACEMENT DES SEDIMENTS SUR LA DISPERSION DES RADIONUCLEIDES, (THE EFFECT OF SEDIMENT DISPLACEMENT ON THE DISPERSAL OF RADIONUCLIDES),
Electricite de France, Chatou.
For primary bibliographic entry see Field 5B.
W77-10402

BEHAVIOR OF DISCHARGED RADIONUCLIDES FROM FUEL REPROCESSING OPERATIONS IN THE AQUATIC ENVIRONMENT OF BOMBAY HARBOUR BAY,
Bhabha Atomic Research Centre, Bombay (India). Environmental Studies Section.
K. C. Pillai, N. N. Dey, E. Mathew, and B. U. Kothari.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 277-300, 8 fig, 9 tab, 16 ref. IAEA-SM-198/16

Descriptors: *Environmental effects, *Water pollution, Radioactivity, *Radioisotopes, Strontium, Ruthenium, Cerium, Cesium, Plutonium, Nuclear wastes.
Identifiers: *Bombay Harbour(India).

High accumulation of Sr 90, Ru 106, Ce 144, Cs 137 and Pu 239 were found in suspended and bottom sediments of Bombay Harbour Bay. In spite of the fact that releases of Pu were small, measurable quantities of this radionuclide were found near the discharge area. In areas near the discharge, benthic organisms showed selective accumulation of radioisotopes of Cs and Ru. A significant portion of Ru 106 found in the outer layers of the Arco shell was found to be present in the organically bound form. Pu uptake by benthic organisms indicated the possibility of higher accumulation of this radionuclide from waste effluents than from fallout. Sr 90 was accumulated in salt from salt pans along the coastline. Transient high levels of radioactivity were observed only at close proximity to discharge locations. The fuel reprocessing operations and the consequent waste releases into the bay have not created any significant environmental radiation problems. (See also W77-10384) (Chilton-ORNL)
W77-10403

CONCENTRATION OF RADIOACTIVE COBALT BY SEAWEEDS IN THE FOOD CHAIN,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5B.
W77-10404

TRANSPORT AND ACCUMULATION OF RADIOCOBALT IN THE MARINE SEDIMENT OF URAZOKO BAY,
National Inst. of Radiological Sciences, Chiba (Japan).
For primary bibliographic entry see Field 5B.
W77-10405

RADIOCAESIUM DYNAMICS IN A CONTAMINATED FLOODPLAIN ECOSYSTEM IN THE SOUTHEASTERN UNITED STATES,
Savannah River Ecology Lab., Aiken, S. C.
C. T. Garten, Jr., J. B. Gentry, J. E. Pinder, III, R. R. Sharitz, and M. H. Smith.
In: Impacts of Nuclear Release into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 331-347, 1 fig, 3 tab, 28 ref. IAEA-SM-198/41.

Descriptors: *Environmental effects, *Water pollution effects, *Radioisotopes, Nuclear wastes, Cesium, Food chains, Sediments, Absorption, Flood plains, *Southeast U.S.

In the study area, the sediments were the primary repository for radiocesium but the radiocesium was not fixed by kaolinite in the sediments and was available for plant uptake. The plants concentrated radiocesium up to 20 times soil concentrations and made it available for entry into food chains. Uptake varied between areas and this variation may be dependent upon potassium availability and abundance of soil organic matter. A reduction in variability of radiocesium concentrations from soils to producers to consumers was noted. This reduction in the variability in contamination levels is an important point to consider in evaluating hazards to man from low-level contamination of food sources. (See also W77-10384) (Chilton-ORNL)
W77-10406

UPTAKE OF COBALT-60 FROM SEA WATER AND FROM LABELLED FOOD BY THE COMMON SHRIMP CRANGON CRANGON (L),
Reactor Centrum Nederland, Petten.
A. W. Van Weers.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 349-361, 4 fig, 3 tab, 5 ref. IAEA-SM-198/44.

Descriptors: *Environmental effects, *Water pollution, Radioisotopes, *Shrimp, *Absorption, Sea water, Radiation.
Identifiers: Radiation exposure.

Results of this study show that the shrimp Crangon crangon accumulates Co60 from sea water mainly by adsorption to the exoskeleton with a concentration factor of about 13 for non-moulted whole shrimps being reached after one month uptake. The low concentration factor for whole animals and the large fraction of Co60 being bound by the exoskeleton indicate that in soft parts a concentration factor of Co60 will not be reached by direct uptake from seawater but Co60 will be taken up by shrimps mainly through the food chain. Uptake from food resulted in a relatively high concentration of Co60 in the digestive gland with the concentration in the abdominal muscles being much lower. Human radiation exposure resulting from consumption of shrimps tends to be overestimated when concentrated factors for whole animals or whole soft parts are used in the dose estimate. (See also W77-10384) (Chilton-ORNL)
W77-10407

HEALTH CRITERIA FOR ESTIMATING ACCEPTABLE CONTAMINATION OF COASTAL WATERS BY RADIONUCLIDES,
Ministerstvo Zdravookhraneniya SSR, Moscow. Institut Biofiziki.
For primary bibliographic entry see Field 5B.
W77-10408

DOSE ESTIMATION AND PREDICTION OF RADIATION EFFECTS ON AQUATIC BIOTA RESULTING FROM RADIOACTIVE RELEASES FROM THE NUCLEAR FUEL CYCLE,
Oak Ridge National Lab., Tenn. Environmental Sciences Div.
B. G. Blaylock, and J. P. Witherspoon.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 377-393, 8 tab, 25 ref. IAEA-SM-198/35.

Descriptors: *Environmental effects, *Water pollution, *Nuclear wastes, *Radioactivity, Aquatic environment, Radioisotopes, Radioecology.
Identifiers: Radiation effects, Dose estimates.

The potential for greater radiation doses to aquatic biota is indicated to be associated with the nuclear fuel supply facilities. Higher doses were found to be due to the naturally occurring radionuclides, Ra226, Po210 and Th230. It was concluded that somatic or genetic effects produced on aquatic biota at the dose rates estimated for conversion, enrichment, fuel fabrication, nuclear power reactors, and reprocessing facilities would not significantly affect the exposed aquatic population. Dose estimates were made by using radionuclide concentration measured in the liquid effluents or representative facilities and, where measurements were not available, predicted radioactive releases to the aquatic environment were used. (See also W77-10384) (Chilton-ORNL)
W77-10409

CONVENTIONAL AND RADIOACTIVE POLLUTANTS OF INLAND WATERS IN AUSTRIA,
Federal Inst. for Water Control, Vienna (Austria).
For primary bibliographic entry see Field 5B.
W77-10410

ASSESSMENT OF DOSES IN THE ENVIRONMENT FOR LIQUID RELEASES FROM NUCLEAR POWER REACTORS,
Nuclear Regulatory Commission, Washington, D. C. Div. of Technical Review.
J. Kastner, and J. S. Bland.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 405-414, 1 tab, 14 ref. IAEA-SM-198/37.

Descriptors: *Environmental effects, *Water pollution, Radioactivity, Radionuclides, Assessments, Nuclear powerplants, Sites, Evaluation.
Identifiers: Environmental impact assessment.

The method of assessment of radiological impact of proposed commercial power reactors is discussed. Detailed evaluations are presented of the impact of liquid releases to the environment, including exposure pathways and probable exposures of individuals and populations. The fundamental equation for calculations of this assessment is R sub ipr equals C sub ip, U sub p, D sub ipr. R sub ipr is the dose rate to organ r from nuclide i via p, and D sub ipr is the dose factor of nuclide i, pathway p, and organ r. It was concluded that the majority of light water reactors have kept their off-site doses well within the Appendix I design objectives even though in several cases the radionuclide distribution was different from that predicted. (See also W77-10384) (Chilton-ORNL)
W77-10411

BIOCHEMICAL AND PHYSIOLOGICAL CHANGES IN EGYPTIAN NILE FISH SUBJECTED TO VARYING LEVELS OF GAMMA IRRADIATION,
National Centre for Radiation Technology, Cairo (Egypt).
H. M. Roushdy, H. S. El-Kashef, and A. E. Imam.
In: Impact of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 415-430, 13 fig, 29 ref. IAEA-SM-198/51.

Descriptors: Environmental effects, *Water pollution effects, *Radioactivity, *Gamma rays, Fish, Biochemistry, Animal physiology, Growth rates.
Identifiers: *Clarias lazera, Tilapia nilotica, Haematology, Glycogen levels, *Nile River(Egypt).

Investigations of the effect of gamma irradiation on Clarias lazera showed the fish to have changed haematological levels (a significant drop in erythrocytic count with adult males being slightly more affected than females), a slight increase in the percentage protein dry weight of muscle, and significant retardation in rate of growth of both juvenile and adult males and females. Investigation with Tilapia nilotica showed a marked initial hyperglycemia and later the blood glucose level decreased with a case of hypoglycaemia dominating. Whole-body irradiation caused an initial transitory rise i glycogen store concentration in liver. At radiation levels of 500 R, the glycogen store showed a prolonged higher level than normal but at levels of 1000 R, a decrease in glycogen store concentration prevailed for the remainder of the 40 day experiment period. (See also W77-10384) (Chilton-ORNL)
W77-10412

AN ANALYSIS OF CRITERIA FOR DETERMINING THE EXTENT OF PERMISSIBLE RADIOACTIVE WASTE DISPOSAL FROM NUCLEAR POWER STATIONS INTO RIVER SYSTEMS,
Hydrometeorological Service of the USSR, Moscow. Inst. of Applied Geophysics.
V. V. Pisarev, and I. S. Tzybizov.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held at Otaniemi, Finland, June 30-July 4, 1975. p 431-440, 1 fig, 1 tab, 12 ref. IAEA-SM-198/52.

Descriptors: *Environmental effects, *Water pollution, Radioactivity, Nuclear powerplants, Ecology, Hydrology, Radioecology, *Radioactive wastes, *Radioactive waste disposal.

Hydrological, ecological and radiological criteria are discussed for the disposal of liquid radioactive wastes into river systems. Measurement of mixing and dilution of wastes in river flows and determination of interaction between river waters and surrounding valleys can be made through the use of hydrological criteria. Ecological criteria are used in establishing quantitative relations between contamination and the environment and in making predictions and analysis of radiation conditions. Radiological critiera concerning maximum concentration values and dose limits can be used if attention is paid to hydrological and ecological factors. (See also W77-10384) (Chilton-ORNL)
W77-10413

A SYSTEM OF RADIATION MONITORING, AND METHODS AND EQUIPMENT FOR MEASURING WATER OF LOW SPECIFIC ACTIVITY,
Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. Institut Atomnoi Energii.
For primary bibliographic entry see Field 5B.
W77-10414

RADIOLOGICAL EFFECTS OF A NUCLEAR POWER PLANT ON A RIVER SYSTEM, AS DEMONSTRATED BY THE GUNDREMMINGEN BWR ON THE DANUBE,
Bayerische Biologische Veruchsanstalt, Munich (West Germany).
H. Herrmann, M. Ruf, K. Hubel, and W. Lunsmann.
In: Impacts of Nuclear Releases into the Aquatic Environment, Proceedings of a Symposium held in Otaniemi, Finland, June 30-July 4, 1975. p 461-472, 7 tab, 6 ref. IAEA-SM-198/14.

Descriptors: *Environmental effects, *Water pollution, Nuclear powerplants, Radioactivity, Rivers.
Identifiers: *Germany(Danube River).

Radiological data based on analysis of water, sediment, and seston samples collected both upstream and downstream of the Gundremmingen nuclear power plant are presented. The most important critical pathway to man for radioactive waste products is the consumption of Danube fish. With the future larger nuclear power stations there will be an annual release rate of 10 Ci in the form of fission and activation products (without H3) and 1000 Ci of H3 per 100 MW(e) installed. Thus nuclear power plants with a total output of about 50,000 MW(e) could be built on the German part of the Danube. (See also W77-10384) (Chilton-ORNL)
W77-10415

THE FISH/WATER ACCUMULATION FACTOR-AN IMPORTANT PARAMETER FOR DETERMINING THE ENVIRONMENTAL CAPACITY OF SURFACE WATERS,
Board of Nuclear Safety and Radiation Protection, Berlin (East Germany).
For primary bibliographic entry see Field 5B.
W77-10416

RELEASE PATHWAYS FOR DEEP SEABED DISPOSAL OF RADIOACTIVE WASTES,
Sandia Labs-1, Albuquerque, N. Mex.
For primary bibliographic entry see Field 5B.
W77-10417

PHOTOSYNTHETIC PROPERTIES OF MARINE BENTHIC GREEN ALGAE FROM DIFFERENT DEPTHS IN THE COASTAL AREA, (IN JAPANESE),
Tokyo Univ. of Education (Japan). Shimoda Marine Biological Station.
Y. Yokohama.
Bull Jap Soc Phycol. 21(2), p 70-75, 1973.

Descriptors: *Photosynthesis, *Algae, *Chlorophyll, *Cladophora, Coasts, Benthos, *Chlorophyta, Coasts, Light, Marine biology, Depth.
Identifiers: Cladophora-wrightiana, *Japan(Shimoda coast), Monostroma-nitida, Ulva-japonica.

Five species of Chlorophyta were collected from different depths in the coastal area of Shimoda, Izu Peninsula (Japan). Photosynthesis-light curves of algae from the intertidal zone were of sun pattern but those of ones from deeper range were of shade pattern. Ulva japonica growing in the range deeper than 10 m. utilized green light by the same efficiency as white light, while Monostroma nitidum and U. pertusa growing in the intertidal zone had an efficiency of green light lower than that of white light. In the absorption spectrum of the living frond of U. japonica a notable bulge was observed in the range around 540 nm where the deep trough existed in the case of Monostroma and U. pertusa. The ratios of chlorophyll a to chlorophyll b in Uivales were 1.9 in M. nitidum, 1.5 in U. pertusa and 1.2 in U. japonica, and those in Cladophora sp. were 1.8 and 1.3 in C. wrightiana. The high efficiency in utilization of the green light observed in U. japonica suggests the adaptation of this alga to the decp water in the coastal area where illumination is greenish. Such a high efficiency may be mainly due to the existence of unknown pigment having an absorption peak at 540 nm in its living frond as well as to its high ratio of chlorophyll b to a. Such a pigment composition may contribute to maintenance of the shade pattern of photosynthesis-light curve in this algae.—Copyright 1974, Biological Abstracts, Inc.
W77-10466

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: COMPONENT STUDY OF BIOLOGICAL COMMUNITIES.
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-10505

RED TIDE IN THE SETO INLAND SEA, (IN JAPANESE),
Nansei Regional Fisheries Research Lab., Maruishi (Japan).
A. Murakami.
Bull Plankton Soc Jap. 19(2), p 131-132, 1973.

Descriptors: *Eutrophication, Nitrogen, Phosphorus, *Red tide, *Dinoflagellates, Water pollution effects, Sea water.
Identifiers: *Japan(Seto Inland Sea).

In the past 10-yr, a serious situation of (phytoflagellate) red tide has developed in the Seto Inland Sea (Japan). The probable cause is excessive eutrophication. In the Seto Inland Sea, the concentration of soluble inorganic N and P in sea water has increased greatly compared with concentrations found 20 yr ago. The only countermeasure of such red tide is to eliminate the source of excessive eutrophication.—Copyright 1974, Biological Abstracts, Inc.
W77-10509

INFLUENCE OF DOMESTIC WASTES ON THE STRUCTURE AND ENERGETICS OF INTERTIDAL COMMUNITIES NEAR WILSON COVE, SAN CLEMENTE ISLAND,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
M. M. Littler, and S. N. Murray.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 072, Price codes: A05 in paper copy, A01 in microfiche. California Water Resources Center, Contribution No 164, June 1977, 88 p. (California Water Resources Center Project UCAL-WRC-W-491). OWRT A-054-CAL(4).

Descriptors: *Domestic wastes, *Intertidal areas, *Biological communities, Seasonal, Fluctuations, *California, Marine animals, Marine biology, Water pollution effects, *Primary productivity, *Outfall sewers, Food webs, Fish food organisms, Waste disposal.
Identifiers: *San Clemente(Calif), *Wilson Cove(Calif).

This project was directed toward studies of the role of stresses imposed by domestic waste waters on marine intertidal organisms, how natural communities of such organisms deal with high-energy inputs from the particulate matter derived from human wastes and the processes controlling community development, food web structure, primary productivity, and seasonal fluctuations in polluted waters. A primary effect of sewage stress in the upper to mid-intertidal was to maintain community development in an early disclimax stage. The outfall area successional plots showed rapid recovery--nearly 100% after less than a month, whereas communities that developed on the unpolluted experimental plots had not fully recovered after one year. The communities occupying the peripheral margins of the outfall habitat showed enhanced abundance of suspension-feeding animals. Species comprising much of the mid-intertidal turf characteristic of the sewage-disturbed area showed considerably greater productivity per unit of thallus area than most of the other macrophytes measured. Outfall populations tended to have higher energy contents than did populations from the unpolluted area. Energy-rich compounds appear to be entering the intertidal food web through the omnivores and suspension feeders of the outfall community. The outfall serves as an attractant and food source for a few species of finfish that are generalized feeders. Macrophytes with higher sewage-tolerance display low photosynthetic quotient values during exposure to effluent; higher values are associated with forms having low physiological tolerance to sewage. It is suggested that tolerant species exhibit carbohydrate metabolism during exposure to effluent stress, whereas intolerant forms tend toward protein and lipid metabolism.
W77-10512

ENVIRONMENTAL IMPACTS OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., Oreg.
For primary bibliographic entry see Field 5D.
W77-10536

THE PRESENT STATE AND PROBLEMS ON THE RED TIDE RESEARCH IN JAPAN, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
For primary bibliographic entry see Field 5B.
W77-10551

ELECTROBIOCHEMICAL NEUTRALIZATION OF ACID MINE WATER,
Geological Survey, Reston, Va. Geologic Div.; and Geological Survey, Reston, Va. Conservation Div.
For primary bibliographic entry see Field 5B.
W77-10569

ACTIVITY OF INTESTINAL ARYL HYDROCARBON HYDROXYLASE IN GUINEA PIGS FED HIGH ELEMENT CONTAINING SLUDGE-GROWN CABBAGE,
Institute of Food Science, Geneva, N. Y.
G. S. Stoewsand, J. G. Babish, and D. J. Lisk.
Federation Proceedings, Federation of American Societies for Experimental Biology, Vol 36, No 3, p 4626, March, 1977.

Descriptors: *Heavy metals, *Toxicity, *Enzymes, *Growth rates, *Vegetable crops, Sludge disposal, Industrial wastes, Municipal wastes, Diets, Waste disposal, Waste water treatment.
Identifiers: Aryl hydrocarbon hydroxylase, Sludge-grown cabbage.

The high levels of heavy metals present in municipal sewage sludge and industrial wastes represent a barrier to agricultural application of these products. A study was performed to examine the potential toxic effects of this application by feeding young male guinea pigs for 100 days on a diet, of which 45% was cabbage grown in municipal sewage sludge. This sludge-grown cabbage contained Al, As, Ba, Cd, Cr, Co, Cu, Eu, Na, Mo, Sr, Th, and Yb at levels 100% more than those in soil-grown cabbage. No adverse effects were apparent in the animals. The guinea pigs fed sludge-grown cabbage had a slightly elevated growth. Aryl hydrocarbon hydroxylase activity in the test animals was 130% of controls. This finding correlates with increased enzyme (hepatic and tissue microsomal mixed-function oxidase) levels observed in prior studies on animals fed high trace-metal, waste-amended diets. (Collins-FIRL)
W77-10576

TRACE ELEMENTS IN WASTEWATER,
California Univ., Riverside. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-10577

A HYGIENIC EVALUATION OF BORON IN POTABLE WATERS, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Medisinskii Institut (I) (USSR). Dept. of Public Hygiene.
T. S. Khachatryan, and A. F. Nazarenko.
Zh Eksp Klin Med. 13(1), p 29-34, 1973.

Descriptors: *Boron, *Potable water, Diseases, *Public health, Water supply, Enzymes, Evaluation, Water pollution effects, *Animal diseases.
Identifiers: *USSR(Moscow).

The effect of water with various B contents on the secretory enzymatic activity of the gastrointestinal tract was observed on 3 dogs in 200 experiments of 6 h each. Solutions of B were made with Moscow (USSR) tap water in 0.5, 1.5, 2.0, 3.0, 4.5, 9.0 and 15.0 mg/l. The animals had their stomachs isolated by the Pavlov method, fistula of the large stomach and an isolated section of the thin intestine by the Tir-Bella method. A depression of secretory and acid-forming functions of the stomach and a lowered quantity of unbound and general acidity of the gastric juices were noted in concentrations of 3 mg/l or more. B lowers enterokinase activity of the intestinal juices and feces by 1.5 x with 3 mg/l concentration and 5-6 x with 2 mg/l concentration. A correlation between the acid-forming function of the stomach and alkaline phosphatase was noted. Introduction of a 15 mg/l concentration of B water led to morphological changes in the epithelium of the mucous membranes and glandular apparatus of the stomach and in the mucous membrane of the intestine.--Copyright 1974, Biological Abstracts, Inc.
W77-10582

THE EFFECT OF URBAN SEWAGE AND INDUSTRIAL WASTES OF BIALYSTOK ON THE PURITY AND BIOCOENOSIS OF THE SUPRASL AND NAREW RIVERS (WPLYW SCIEKOW MIEJSKICH I PRZEMYSLOWYCH M. BIALEGOSTOKU NA CZYSTOSC I BIOCENOZE RZEKI SUPRASLI I NARWI),
Bialystok Medical Academy (Poland). Div. of Hygiene.
T. Januszko, and E. Malyszko.
Gaz, Woda i Technika Sanitarna, Vol. 51, No. 2, p 48-51, 1977. 22 ref.

Descriptors: *Water pollution effects, *Municipal wastes, *Industrial wastes, Water pollution control, Rivers, Turbidity, Odor, Oxidation, Ammonia, Nitrites, Chlorides, Bacteria, Waste disposal, Waste water treatment.
Identifiers: Bialystok(Poland), Suprasl River, Narew River.

The effect of a tributary river, Biala, carrying urban sewage and industrial waste material, on the purity and biocoenosis of the downstream sections of the Suprasl and Narew Rivers is evaluated. Five water-testing positions at varying distances from the pollution source were selected. Water samples for physico-chemical, bacteriological, and hydrobiological tests were taken, as were plankton samples. Physico-chemical properties were determined by domestically developed mthods. Differentiation of microorganisms was undertaken by routine processes. It was determined by standard methods that the pollution of the downstream section of the sewage and waste-carrying Biala River was very high. Wastes in the Biala caused high water pollution of the lower segment of the Suprasl River, as indicated by higher water turbidity, specific odor, high oxidizability, and much higher ammonia, nitrite, and chloride levels. However, by physico-chemical standards, Suprasl River contaminants did not significantly affect the Narew River. This phenomenon could be explained by the considerable dilution of the pollutants entering the Narew River. Microbiologically, the Biala River exhibited a superiority of rods over cocci; the Suprasl had at first a low bacterial index, and downstream had an increase of rods. In the Narew, cocci at first slightly dominated over rods; in its lower part, affected by the water of the Suprasl, rods numerically equalled cocci. The downstream portions of the Suprasl and Narew Rivers polluted by the waters of the Biala were characterized by the disappearance of pollution-sensible hydrobiological species and domination of saprobic species. (Takacs-FIRL)
W77-10593

GREAT LAKES EUTROPHICATION: THE EFFECT OF POINT SOURCE CONTROL OF TOTAL PHOSPHORUS,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
S. C. Chapra, and A. Robertson.
Science, Vol 196, No 4297, p 1448-1450, June, 1977. 1 fig, 13 ref.

Descriptors: *Eutrophication, *Mathematical models, *Phosphorus, *Great Lakes, Water quality standards, Loads(Forces), Domestic wastes, Surface runoff, Waste water treatment.

A mathematical model was developed to describe phosphorus-induced eutrophication in the Great Lakes. The model of the total phosphorus budgets for the Great Lakes was based on the assumption that a lake's trophic state is predominantly determined by its phosphorus levels. Basic forcing functions of the model were variables which represented human activities in each drainage basin. These variables were translated into phosphorus loadings by a waste source submodel. Three groups of waste sources were considered: domestic sources, land runoff, and atmospheric inputs. The model acknowledges exchange between lakes and in-lake losses. The latter was a first-order loss whose basic parameter was the apparent settling velocity of total phosphorus. The model was a set of ordinary differential equations. The model revealed that a 1 mg/liter effluent restriction would provide significant water quality improvements. Phosphorus levels in central and eastern basins of Lakes Erie and Ontario would fall from over 20 micrograms/liter to about 10 micrograms/liter. Even lower concentrations would be achieved in Lake Michigan. Minor im-

provements would be effected in Lakes Superior and Huron. The western basin of Lake Erie, Saginaw Bay, and lower Green Bay have naturally higher phosphorus concentrations. The proposed restriction would not reduce total phosphorus in these areas below 20 micrograms/liter. (Collins-FIRL)
W77-10597

ANNUAL CYCLE OF PRIMARY PRODUCTION AND ITS RELATION TO THE NUTRIENTS IN CANARY ISLAND WATERS, (IN SPANISH),
Instituto Espanol de Oceanografia, Madrid (Spain).
A. R. De Leon, and J. G. Braun.
Bol Inst Esp Oceanogr. 167, p 1-24, 1973.

Descriptors: *Primary productivity, *Atlantic Ocean, *Chlorophyll, Light, *Nutrients, Oxygen, Seasonal, Temperature, Thermocline, *Annual.
Identifiers: *Canary Islands(Spain).

For 12 mo. investigations were carried out at a station situated in the Atlantic Ocean 2 miles from the coast, off Santa Cruz de Tenerife, at a depth of 780 m. During this time we measured the primary production, chlorophyll a, light penetration, temperature, O2, phosphate, nitrite, nitrate and silicate within the upper 200 m. of the station. A seasonal cycle of production was observed, with maximum values in spring, 954 mg C/m2/day and minimum in summer 129 mg C/m2/day in accordance with the distribution of chlorophyll a. Production was dependent upon vertical mixing, associated with the presence of a seasonal thermocline. Nutrient concentration was very low and showed little evidence of seasonal variability, with maximum values of 0.18 micrograms-atm P/l. and 1.50 micrograms-atm N/l. Production depended on a rapid recycle of nutrients on the first 200 m.--Copyright 1974, Biological Abstracts, Inc.
W77-10598

PATHOGENIC AMOEBAS FROM BRACKISH AND OCEAN SEDIMENTS, WITH A DESCRIPTION OF ACANTHAMOEBA HATCHETTI, N. SP.,
National Marine Fisheries Service, Oxford, Md.
T. K. Sawyer, G. S. Visvesvara, and B. A. Harke.
Science, Vol. 196, No. 4296, p 1324-1325, June, 1977. 1 fig, 1 tab, 12 ref.

Descriptors: *Water pollution sources, *Pathogens, *Aquatic microorganisms, Sewage disposal, Algae, Water pollution control, Water pollution effects, Diseases, Infection, Waste disposal.
Identifiers: Acanthamoeba culbertsoni, Acanthamoeba hatchetti, n. sp., New York Bight, Baltimore Harbor(Maryland).

Ocean disposal of sewage wastes was considered in a study on pathogenic amoebas from brackish and ocean sediments. Sediments from various locations, including the New York Bight and the Baltimore Harbor, were examined. Acanthamoeba culbertsoni were isolated from Bight sediment and Acanthamoeba hatchetti, n. sp., were found in Baltimore Harbor sediment; both proved deadly to laboratory mice. Since Acanthamoeba are generally found in soil and freshwater, their distribution in brackish water and ocean sediment was attributed to stream and river runoff and to marine disposal of sewage and dredge spoils. The disposal of sewage in previously unaffected marine areas should be carefully considered. Amoeba-virus interactions should be further studied since amoebas feed on filamentous blue-green algae and are a reservoir for strain LPP-1 cyanophage. (Collins-FIRL)
W77-10639

ACTIVITY OF PHYTOPLANKTON EXCRETED BY FISH,
Tokyo Metropolitan Univ. (Japan). Faculty of Science.
N. Nakamoto, and T. Okino.
Bull Plankton Soc Jap. 19(1), p 1-4, 1972.

Descriptors: *Phytoplankton, Algae, *Chlorophyta, Eutrophication, *Chlorophyll, Ponds, Water pollution.
Identifiers: *Goldfish, Fish ponds.

When green algae bloomed in a fish pond, omnivorous goldfish (Carassius carassius) ate them. The ingested green algae were excreted without digestion. The chlorophyll in the feces was almost unchanged from the chlorophyll in the phytoplankton of the fish pond. The phytoplankton excreted by the fish still had the same activity as the phytoplankton in the fish pond.--Copyright 1974, Biological Abstracts, Inc.
W77-10642

THE PHYSIOLOGICAL CHARACTERISTICS OF NERITIC RED TIDE FLAGELLATES, (IN JAPANESE),
Hiroshima Univ. (Japan). Faculty of Fishesies and Animal Husbandry.
Bull Plankton Soc Jap. 19(2), p 104-114, 1973.

Descriptors: *Red tide, *Dinoflagellates, *Neritic, *Plant growth, vitamins, Gymnodinium, Iron, Manganese, Nitrogen, *Nutrients, Phosphorus, Proteins, Rainfall, Salinity, Runoff, Temperature.
Identifiers: B-12, Biotin, Eutreptiella sp, Exuviaella sp, Gymnodinium nelsoni, Heterosigma akashiwo, Heterosigma inlandica, *Japan, Peridinium hangoei, Polykrikos schwartzi, Purines, Pyrimidines, Rhodomonas ovalis, Thiamine.

This article is a collective summarization of the 6 serial reports on the neritic red tide flagellates. Axenic cultures of the organisms were obtained by micropipette washings, then, the growth response to the ecological factors, such as temperature, salinity, pH and the nutrient requirements, with special reference to the growth promoting substances, were examined on 8 spp. of flagellates. All the organisms tested grow well in the water temperature higher than 20C (optimal temperature 21-26C). Most of them are euryhaline over a wide range. The organisms can utilize nitrate-N, ammonium-N, and urea. Nitrate-N is the best N source, and is utilized by all the organisms. Several organisms grow greatly in the low concentration of ammonium-N (< 300 micrograms-N/l). All the organisms are able to utilize both inorganic and organic P and store the P in excess. All the organisms need vitamin B12 for growth. Three of them, Rhodomonas ovalis, Polykrikos schwartzi and Eutreptiella sp. also require thiamine and biotin. These organisms are divided into 3 types by nutrient requirements. Great multiplication of the organisms is induced by supply of N, P and vitamins under good combination of ecological factors. The red tide caused by these organisms may be expected to occur by addition of water washed from the land after heavy rainfall or by polluted water (Heterosigma akashiwo, Rhodomonas ovalis). The growth of the organisms is stimulated by supply of the high concentration of Fe or/and Mn (Eutreptiella sp. (I), Exuviaella sp.). The growth of the organisms is accelerated by addition of the special organic substances such as purines and pyrimidines or decomposed matter of proteins. A majority of the neritic red tide flagellate belong to this type (Heterosigma inlandica, Peridinium hangoei, Gymnodinium nelsoni, Polykrikos schwartzi and Exuviaella sp.). Frequent occurrence of red tides in the Inland Sea (Japan) is probably caused mainly by the organic pollution of the sea-water. The growth mechanisms of flagellates leading to the red tide are illustrated.--Copyright 1974, Biological Abstracts, Inc.
W77-10686

SEASONAL CHANGE OF GROWTH PROMOTING EFFECT OF MUD EXTRACTS AND SEA WATER COLLECTED DURING VARIOUS SEASONS AT ISE BAY ON A RED TIDE FLAGELLATE HETEROSIGMA INLANDICA HADA, (IN JAPANESE),
Mie Prefectural Univ., Tsu (Japan). Faculty of Fisheries.
F. Uyeno, and K. Nagai.
Bull Plankton Soc Jap. 19(2), p 97-103, 1973.

Descriptors: *Seasonal, *Red tide, *Plant growth, *Mud, *Sea water, Bays, Dinoflagellates, Mixing, Eutrophication, Water pollution, Nutrients.
Identifiers: Heterosigma-inlandica, *Japan(Ise Bay).

To clarify whether the growth promoting effect on the red tide flagellates of sea mud has a seasonal variation, and when the effect reaches the photosynthetic layer, a series of experiments were performed with samples of sea mud and sea water collected at a station of Ise Bay (Japan) during various months. H. inlandica was used as an indicator. Mud collected in Sept., Oct., and Dec. showed a large growth promoting effect; samples taken from May-Aug. showed about half the growth effect of the Oct. one. Generally, water samples from deeper layers showed larger effects, but throughout Oct. only from bottom to surface, there was a rather large uniform effect. There is a seasonal variation in the growth promoting effects of bottom mud on red tide organisms, but the supply of the factor to the upper layers may be dependent on the moderate autumnal vertical transport of bottom water to the euphotic zone. Perhaps, the coincidence of the season during which the growth promoting effects by the mud and by the water occur prominently is not a general pattern in Ise Bay, because the mechanism in both cases is completely different. This means that there is possibility to grow a red tide by the mixing of mud and water. In shallow waters, the growth promoting substances can easily attain the surface at any season.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10701

TOXICITY OF EFFLUENTS FROM THE PURIFICATION OF TALL OIL PRODUCTS AND CRUDE TURPENTINE FOR THE MICROFLORA OF TREATMENT FACILITIES (OPREDELENIE TOKSICHNOSTI STOCHNYKH VOD OT USTANOVOK PO OCHISTKE TALLOVYKH PRODUKTOR I SKIPIDARA-SYRTSA PO OTNOSHENIYU K MIKROFLORE OCHISTNYKH SOORUZHENII),
Z. K. Kuptsova, N. P. Drozdov, and N. G. Konovalova.
Lesokhimiya Podsochka, No. 4, p 7-8, 1976. 2 tab.

Descriptors: *Toxicity, *Microorganisms, *Effluents, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Activated sludge, Waste water treatment, Water pollution treatment, Waste treatment, Biochemical oxygen demand, Chemical oxygen demand, Phosphorus, Nitrogen, Ammonia, Nitrates, Bacteria, Burning, Neutralization, Byproducts.
Identifiers: *Tall oil, *Turpentine, Nitrites, Black liquor.

Effluents from sulfate soap decomposition, tall oil rectification, and crude turpentine rectification were purified by the activated sludge process, using the sludge from the Kotlas and Bratsk wood-processing complexes. The overall effluents from the two mills, purified under the same conditions, served as controls. The course of purification was evaluated by weekly determinations of BOD, COD, contents of phosphorus, ammonia nitrogen, nitrites and nitrates, and total bacterial counts. The initial reduction of the number of bacteria, due to adaptation to the substrate, was followed within a few days by normal growth. No toxic effects of the tall oil and turpentine products on the activated sludge were observed. Consequently, effluents form the distillation of tall oil and turpentine can be purified jointly with the overall mill ef-

fluents. The effluent from sulfate soap decomposition, because of its high content of pollutants, should not be purified jointly, but should either be burned or neutralized and evaporated jointly with black liquor. (Stapinski-IPC)
W77-10703

A SUMMARY OF RECEIVING WATER DISSOLVED OXYGEN CONDITIONS BELOW PULP AND PAPER MILL LOCATIONS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5B.
W77-10705

GYMNODINIUM TYPE-'65 RED TIDE IN OCCURRING ANOXIC ENVIRONMENT OF OMURA BAY, (IN JAPANESE),
Nagasaki Univ. (Japan). Faculty of Fisheries.
S. Iizuka.
Bull Plankton Soc Jap. 19(1), p 22-33, 1972.

Descriptors: *Red tide, *Gymnodinium, Bays, Ammonia, Dissolved oxygen, Phosphates, Silicates, Vitamins, Salinity, Oxygen requirements, Hydrogen ion concentration.
Identifiers: *Anoxic environment, *Japan(Omura Bay).

The Gymnodinium type-'65 red tide in Omura Bay (Japan) may be classified into 'July red tide' associated with the inflow of fresh water in rainy season and 'September red tide' connected to the anoix bottom water. The frequent occurrence of September red tide has been limited to the regions in the vicinity of the anoxic central part of the bay and the red tide occurred when O2 tension in the bottom water of the regions attained less than 0.5 cc/1. Then, the pH value of the bottom water was less than 7.8, which coincided with the optimum pH value for the growth of the causative organisms. Field observations and laboratory work established that Gymnodinium type-'65 and 2 other strans were highly tolerant of low O2 concentration and were stimulated by sulfide in the medium. Phosphate and ammonia may be released from the bottom mud when oxygen tension is very low. A scheme is presented to show how the seasonal red tides could occur in Omura Bay.--Copyright 1974, Biological Abstracts, Inc.
W77-10706

GROWTH OF GYMNODINIUM TYPE-'65, CAUSATIVE ORGANISM OF RED TIDE IN OMURA BAY, IN MEDIUM SUPPLIED WITH BOTTOM MUD EXTRACT,
Nagasaki Univ. (Japan). Faculty of Fisheries.
K. Hirayama, and K. Namaguchi.
Bull Plankton Soc Jap. 19(1), p 13-21, 1972.

Descriptors: *Gymnodinium, *Plant growth, *Benthos, Mud, *Red tide, Nutrients, Bays, Sea water, Eutrophication, Growth rates, Degradation(Decomposition).
Identifiers: Anoxic conditions, *Japan(Omura Bay).

Regarding the red tide which occurred in Omura Bay, Japan, detailed field observation shows that the outbreak of the red tide is preceded by the anoxic or nearly anoxic status in the bottom water owing to the bloom on 1 of the species of Gymnodinium, Iizuka and Irie (1969) found. The possibility that the dissolution of materials from the bottom mud into sea water accelerated the growth of this species is studied. A hot water extract of bottom mud collected in Aug. when red tide frequently occurred, promoted the growth of the organism. It could not be clarified whether or not the bottom mud collected in April when red tide rarely occurred had such an effect. Growth in the medium supplied with supernatant fluid of anaerobically decomposed mud was more accelerated than in the medium supplied with aerobically decomposed fluid. Sodium sulfide added to the medium in low concentration promoted growth. The dissolution of anaerobically decomposed bottom mud into sea water could be one of the causes of the outbreak of the red tide in Omura Bay.--Copyright 1974, Biological Abstracts, Inc.
W77-10707

HOLOZOIC NUTRITION OF THE CILIATED PROTOZOA: ITS CONSEQUENCES IN THE NATURAL AND ARTIFICIAL PURIFICATION OF WATER, (IN FRENCH),
Institut Pasteur, Lille (France). Laboratoire d'Hydrobiologie.
D. Dive.
Annee Biol. 12(7/8), p 343-380, 1973.

Descriptors: *Protozoa, Nutrients, *Water purification, Self purification, *Bacteria, Microorganisms, Pathogenic bacteria.
Identifiers: Holozoic nutrition.

A review of experiments and observations of ciliated Protozoa in the complex interactions among microflora in natural and artificial media is discussed along with possible applications in the fields of water purification and pisciculture. These protozoa flourish in water with high microorganism concentrations. Nutritional selectivity often results in the eradication of fecal bacteria and pathogenic germs and the subsequent formation of the biocenosis composed of microorganisms nonbeneficial to these Ciliates. Bacteria studied included numerous species of Escherichiae, Salmonellae, Klebsiellae, Proteae, Pseudomonas, Chromobacterium, Spirillaceae, Micrococcacae, Lactobaccilacea, Bacillacae and mycobacteria. Protozoa tested included Amoebae spp., Peritricha, Hypotricha, Holotricha, Trichostoma, Tetrahymenidae, and Paramecium.--Copyright (c) 1974, Biological Abstracts, Inc.
W77-10708

DAPHNIA PULEX PULLS ITS WEIGHT IN PULP MILL TOXICITY TESTS,
MacMillan Bloedel Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5A.
W77-10718

A PRESENTATION OF THE NORWEGIAN EFFECT 'ACID PRECIPITATION-EFFECTS ON FOREST AND FISH',
Royal Norwegian for Scientific and Industrial Research, Kjeller.
L. N. Overrein.
Water, Air and Soil Pollution, Vol. 6, No. 2-4, Sept.-Nov. 1976, p 167-172.

Descriptors: Foreign projects, Foreign research, Acid-base equilibrium, Precipitation(Atmospheric), Runoff, Eutrophication, Path of pollutants, Soil contamination, Water pollution, Fishkill, Forests, *Air pollution effects.
Identifiers: *Norway, *Acid precipitation.

An overview is given of the Norwegian SNSF Project, a research effort mounted in 1972 for the purposes of establishing as precisely as possible the effects of acid precipitation on forests and on freshwater fish, and of investigating the effects of air pollutants on soil, vegetation, and water, to the extent needed to learn about the acid precipitation effects of these pollutants. The multidisciplinary, project-oriented, cross-institutional, self-governing research effort involved mainly four institutes and is coordinated by the Norwegion Institute of Air Research. The whole of Norway is used as the field of operation. No findings are published for the project, but initial basic ongoing research areas are catalogued for studies of air pollution deposition, effects on the forest environment, effects on aquatic ecosystems and effects on inland fishing. Intensive studies are being carried out to quantify damages to forest growth caused by long-range transported air pollutants. Also being studied are high pH levels in runoff waters from snowfields in terms of effects on ecosystems in Norwegian lakes and rivers. (Harris-Wisconsin)
W77-10724

POLYCHLORINATED BIPHENYL INHIBITION OF MARINE PHYTOPLANKTON PHOTOSYNTHESIS IN THE NORTHERN ADRIATIC SEA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
L. W. Harding.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 5, p 559-566, 1976. 1 fig, 3 tab, 33 ref. NSF GF31947X and GA 3127X.

Descriptors: *Polychlorinated biphenyls, *Marine algae, *Photosynthesis, *Inhibition, Sea water, Ecological distribution, Analytical techniques, Water pollution effects.
Identifiers: *Adriatic Sea.

The extent of photosynthetic inhibition of natural phytoplankton assemblages from the north Adriatic Sea by PCBs was investigated by taking samples at various stations and then placing them in incubation bottles to which were added the PCB Aroclor 1254 to yield concentrations of 1.0, 10.0, 50.0 or 100.0 microgram/l. The PCB reduced phytoplankton photosynthesis in doses as low as 10 microgram/l. Analysis of variance indicated differences among stations as an important factor governing the magnitude of PCB-induced photosynthetic inhibition. The manner in which PCBs are introduced into marine waters and partitioned among particulate components, and the form in which these contaminants are available to phytoplankton are important variables in the degree of photosynthetic inhibition. The amounts available to phytoplankton may be far greater than the quantities detected in seawater as PCBs are removed through various biological and physical uptake mechanisms almost immediately upon their introduction, thus PCB concentrations may reflect merely the transient presence of these compounds. Elevated phytoplankton standing crops and increased concentrations of suspended organic material could influence the manner in which lipophilic compounds (which enhance solubilization of PCBs) are partitioned among the particulate components. Also different phytoplankton species exhibit different tolerances for PCBs, thus similar doses may elicit dissimilar responses from various phytoplankton aggregates. (Auen-Wisconsin)
W77-10728

THE EFFECTS OF VARIOUS AROCLOR FRACTIONS ON THE POPULATION GROWTH OF CHLORELLA PYRENOIDOSA,
Wheaton College, Norton, Mass. Dept. of Biology.
M. L. Hawes, J. C. Kricher, and J. C. Urey.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 1, p 14-18, 1976. 2 tab, 15 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Chlorella, *Environmental effects, Inhibition, Chlorine, Toxicity, Pesticide residues, Water pollution effects.

The effects of the PCB Aroclor at different chlorine contents (Aroclor fractions 1242, 1254, and 1268) on Chlorella pyrenoidosa populations were tested at concentrations of 1 ppm and 100 ppb. Aroclor 1242 treated populations were reduced by 64% in 8 hours. Aroclor 1254 produced a 45% reduction, and Aroclor 1268 resulted in a 36% reduction at 8 hours. Aroclor 1242 populations remained at much lower densities than the control but the difference between the controls and the cultures decreased as populations grew. The Aroclor 1254 treated populations equaled the controls by 129 hours. Aroclor 1268 reached the control population levels by 56 hours. These results indicate that the initial perturbation caused by each Aroclor was inversely related to the

chlorine content of the PCB. These experimental results agree with the theory that sublethal effects of PCB toxicity are not directly correlated with chlorine content whereas lethal effects are inversely correlated, provided only if Chlorella cells are killed by PCB concentrations. However, the actual cause of the reduced populations was unknown. Experiments with Aroclor concentrations of 100 ppb compared with concentrations of 1 ppm demonstrated that lower concentrations of PCB had decidedly less effect on the Chlorella population growth. The indications are that these PCBs exert a temporary depressing effect on these populations and only at a concentration substantially higher than currently found in most ecosystems. (Auen-Wisconsin)
W77-10729

A PRODUCTION MODEL FOR MYRIOPHYLLUM SPICATUM L.,
Wisconsin Univ., Madison. Dept. of Botany; and Oak Ridge National Lab., Tenn.
J. Titus, R. A. Goldstein, M. S. Adams, J. B. Mankin, and R. V. O'Neill.
Ecology, Vol 56, No 5, p 1129-1138, 1975. 5 fig, 1 tab, 33 ref. NSF AG-199, BMS69-01-147A09, SFG2-6308.

Descriptors: *Aquatic weeds, *Productivity, *Mathematical models, Submerged plants, *Wisconsin, Photosynthesis, Temperature, Light, Plant growth, Depth, Growth rates, Eutrophication, Lakes.
Identifiers: Water milfoil, *Lake Wingra(Wis), Myriophyllum spicatum L, Model WEED.

A mathematical model--WEED--was developed to study the productivity and growth form for the submerged macrophyte (Myriophyllum spicatum L. in Lake Wingra, Madison, Wisconsin. The model coordinates four biomass compartments (leaves, stems, roots and carbohydrates) with selected physiological processes evaluated for a stratified sq m water column. Light and temperature are the primary forcing functions. The model considers growth form (depth distribution of biomass), total biomass/sq m, the depth profile of photosynthesis and macrophyte contributions to dissolved and particulate organic matter pools. Model explorations of depth distribution as a function of turbidity have generated a general hypothesis about growth strategies in macrophytes. In shallow turbid waters, there may be a selective advantage to the production of photosynthetic tissue at the base of the plant with later sloughing of this tissue when a canopy is formed at the surface. In deeper water, there may be a distinct advantage to increasing overwinter storage permitting rapid surfacing in spring. The response of Myriophyllum growth to temperature and light is emphasized. (Auen-Wisconsin)
W77-10731

THE INTERACTION OF NITROGEN ASSIMILATION WITH PHOTOSYNTHESIS IN NITROGEN DEFICIENT CELLS OF CHLORELLA,
University Coll. of Swanea (Wales). Dept. of Botany and Microbiology.
R. J. Thomas, C. R. Hipkin, and P. J. Syrett.
Planta, Vol 133, No 1, p 9-13, 1976. 2 fig, 4 tab, 30 ref.

Descriptors: *Chlorella, *Photosynthesis, *Nitrogen, *Respiration, *Nitrites, *Nitrates, Inorganic compounds, Biochemistry, Cultures, Light, Denitrification, Carbon dioxide.
Identifiers: Chlorella fusca, *Nitrogen assimilation.

The effects of adding inorganic nitrogen on the photosynthesis of nitrogen-deficient chemostat cultures of Chlorella fusca were investigated to determine their carbon dioxide fixation capacity. Addition of nitrate or nitrite reduces carbon dioxide fixation by as much as 75% due to the competition for electrons; the nitrite reduction step is the main competitor. The rate of nitrate disappearance is not affected by light nor greatly inhibited by DCMU, (3-(3',4'-dichloro)-1-1-dimethyl urea). But in darkness, or in light plus DCMU, about half of the nitrate which disappears accumulates as nitrite. Similarly, the rate of nitrite assimilation is only half as fast in darkness as in light and the addition of DCMU reduces the rate in light to the rate in darkness. The conclusion is that in nitrogen-deficient cells reduction of nitrate to nitrite can efficiently proceed by electrons derived from dark respiratory reactions, but the nitrite reduction step takes electrons both from dark respiration and from the photochemical mechanism. Tests with CCCP (carbonyl cyanide m-chlorophenylhydrazone) indicated that phosphorylation is less important; although nitrate assimilation is somwehat inhibited, no nitrite accumulates. Ammonium also reduces the carbon dioxide fixation rate by nitrogen-deficient cultures although its effect is less marked than that of nitrate or nitrite. (Auen-Wisconsin)
W77-10732

EFFECTS OF ACIDITY ON THE PHYTOPLANKTON AND PRIMARY PRODUCTIVITY OF SELECTED NORTHERN ONTARIO LAKES,
Guelph Univ. (Ontario). Dept. of Zoology.
R. E. Kwiatkowski, and J. C. Roff.
Canadian Journal of Botany, Vol 24, No 22, p 2546-2561, 1976. 8 fig, 6 tab, 49 ref.

Descriptors: *Acidic water, *Primary productivity, *Biological communities, *Air pollution effects, Varieties, Dominant organisms, Plankton, Hydrogen ion concentration, *Canada, Lakes.
Identifiers: Sudbury lakes(Ontario), Canadian Shield Lakes, Ruth and Roy Lake(Ontario), Johnnie Lake(Ontario), Carlyle Lake(Ontario), Spoon Lake(Ontario), Attlee Lake(Ontario), Daoust Lake(Ontario).

How depressed pH affects primary productivity and the planktonic and benthic communities was investigated in six lakes of the Sudbury area of Ontario, (Canada), where atmospheric sulfur dioxide fallout from a local nickel-copper mining complex increases the hydrogen ion concentration. The purpose of the study was to determine hydrogen ion levels which limit primary production and consequent changes in numbers and species composition of the phytoplankton, zooplankton and zoobenthos communities. Hydrogen ion activity varied from pH of 4.05 to 7.15 in the six lakes, with higher pH values associated with the harder water lakes. Heavy metals concentrations were well below limits lethal to the majority of the plankton species. Declining pH reduced chlorophyll-a with resultant increases in transparency. As pH declined, Chlorophyta diminished in importance and the Cyanophyta became dominant. The phytoplankton diversity index retained relatively unchanged between pH values of 7.0 to 5.0 but decreased at lower values. Primary production (mg C/cu m/hr) was reduced in lakes below pH 5.5; however, as a result of the increased depth of the phobic zone in more acidic conditions, primary production remained high down to pH 4.4, below which it was drastically reduced. The plankton species found in these six lakes are listed. (Auen-Wisconsin)
W77-10733

A BASIC STUDY ON APPLICATION OF SYSTEMIC INSECTICIDES: V. EFFECTS OF RAINFALL ON TOXICITY OF VAMIDOTHION AND MALATHION, (IN JAPANESE),
Shionogi Co. Ltd., Shiga (Japan). Aburahi Lab.
T. Ishiguro, and S. Katayama.
Jpn J Appl Entomol Zool. 18(1), p 32-35, 1974.

Descriptors: *Insecticides, *Insect control, Rice, *Spraying, Rainfall, Crops, *Toxicity, Water pollution effects.
Identifiers: Leafhopper, *Malathion, Nilaparvata lugens, *Vamidothion.

Young rice plants were sprayed with vamidothion and malathion; artificial rain was administered before and after spraying. The plants were then placed in a polyethylene tube with 10 brown leafhoppers, Nilaparvata lugens. The effect of rainfall on the insecticidal properties of vamidothion and malathion was evaluated. In the case of vamidothion, rainfall before spraying had no influence on the insecticidal effect; with malathion, however, this rate decreased slightly. Rainfall after spraying diminished the insecticidal effects of both substances. Copyright 1975, Biological Abstracts, Inc.
W77-10737

TOXICITY OF ALKYLDINITROPHENOLS TO SOME AQUATIC ORGANISMS,
Fisheries and Marine Service, St. Andrews (New Brunswick).
V. Zitko, D. W. McLeese, W. G. Carson, and H. E. Welch.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 508-515, 1976. 2 tab, 21 ref.

Descriptors: *Phenolic pesticides, *Toxicity, Atlantic salmon, Crayfish, Lobsters, Fungicides, Acaricides, Herbicides, Agricultural runoff, Juvenile fish, Pesticide drift, Mode of action, *Phenols.
Identifiers: *Alkyldinitrophenols, Godin Brook(NH).

The acute toxicity levels of 18 2-alkyl-4,5-dinitrophenols (used as fungicides, acaricides, and herbicides) to juvenile Atlantic salmon, crayfish and lobster are presented, based on their respective octanol-water partition coefficients. The lethal threshold of alkyldinitrophenols to juvenile salmon, ranges from 0.70 mg/l for 2,4-dinitrophenol to 0.02 mg/l for dinocap. An equation was written to predict the lethal threshold of these compounds to the salmon. The tested compounds included both phenols and their esters and indications are that the ester group increases the transport rate of the compound to the active site but has no effect on the toxic mechanism. Octydinitrophenols are the most toxic of the alkyldinitrophenols. Dinoseb is extremely toxic to lobster larvae and has a lethal threshold of 0.0075 mg/l. Adult lobsters are more resistant, with an estimated threshold at 0.3 mg/l or lower. Crayfish are considerably more resistant since they survived exposures to 10 mg/l for 144 h. Alkyldinitrophenols are not bioaccumulated or biomagnified and their presence would be undetectable by analyses of aquatic fauna. The losses of alkyldinitrophenols by evaporation, adsorption, and uptake by the test animals were practically negligible and the hydrolysis rate is quite slow. Godin Brook, New Hampshire, polluted with dinoseb at a concentration of 4.81 mg/l, was devoid of fish and contained virtually no insects. (Auen-Wisconsin)
W77-10738

HEAVY METAL CONCENTRATIONS IN ORGANISMS FROM AN ACTIVELY DREDGED TEXAS BAY,
Texas A and M Univ., College Station. Dept. of Oceanography.
R. R. Sims, and B. J. Presley.
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 5, p 520-527, 1976. 3 tab, 16 ref. DACW64-62-C-0046.

Descriptors: *Environmental effects, *Heavy metals, *Dredging, *Bays, Mollusks, Crustaceans, Fish, *Texas, Arsenic compounds, Cadmium, Copper, Lead, Mercury, Zinc, Oysters, Clams, Shrimp, Crabs.
Identifiers: *San Antonio Bay(Texas), *Bioaccumulation.

Concentrations of arsenic, cadmium, copper, lead, mercury and zinc were determined by laboratory analysis in mollusks, crustaceans and bony fish of San Antonio Bay, Texas, which has been dredged for more than 50 years. Oysters and clams contained the highest levels of these metals but concentrations were lower than those mollusks from other areas along the Gulf of Mexico not subjected to dredging. Higher copper and zinc levels in these organisms are due to their use of these elements as metabolites, but showed no relationship to dredging in the bay. Brown and white shrimp and blue crab did not differ appreciably in heavy metal content from crustaceans in other regions. The bony fish appeared to be lower in cadmium, copper, lead and zinc than the same species from non-dredged and relatively unpolluted areas. Various fish tissues showed a distinct preferential uptake; the liver tended to concentrate cadmium, copper and zinc while the heart concentrated lead. The stomach and flesh showed lower metals concentrations than other tissues. It is apparent that metal concentrations in the sediments from depths up to 2 meters are both low and uniform, indicating that the sediments do not represent any unusual metal reservoir for dredging to disturb and that no recent increase in metal input to the bay had occurred. (Auen-Wisconsin)
W77-10739

STUDIES ON THE MECHANISMS OF RED TIDE OCCURRENCE IN HAKATA BAY: II. GENERAL FEATURES OF RED TIDE FLAGELLATE, HETEROSIGMA SP., (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Dept. of Fisheries.
T. Jonjo, and T. Hanaoka.
Bull Plankton Soc Jap. 19(2), p 75-81, 1973.

Descriptors: *Red tide, *Chlorophyll, Asia, Bays, Vitamin B, Nitrates, Hydrogen ion concentration, Phosphates, Pigments, Salinity, Silicates, Growth rates.
Identifiers: *Flagellates, *Heterosigma-sp, *Japan(Hakata Bay), Vitamin B-12.

A red tide flagellate, Heterosigma sp., was isolated from the sea water of Hakata Bay (Japan). The present work was designed to find out some general features of the organism under laboratory conditions. The organism found to be euryhaline (Cl 9.0-19.0%o) and the optimal chlorinity was 13.5%o. The optimal pH range was from 8.0-8.5. The organism could not develop and multiply without addition of the 'mud supernatant' even in the sea water enriched with NaNO3, K2HPO4, Na2SiO3, and vitamin B12. The optimal volume of the 'mud supernatant' to be added for the growth was 0.1-0.5 ml per 5 ml medium. The optimal inoculum size was 4 x 10 to the 4th power cells per 5 ml medium. Some morphological variations were observed under different cultural conditions. As to the intracellular pigments, the percentage of the pheo-pigments (Fa) to the pheopigments and chlorophyll-a (Fo) combined, i.e., Fa/(Fa + Fo) x 100(%) ranged from 25% in the exponential growth phase to 55% in the stationary phase.--Copyright 1974, Biological Abstracts, Inc.
W77-10740

THE ABUNDANCE OF DIATOMS IN THE SOUTHWESTERN NEARSHORE REGION OF LAKE ONTARIO DURING THE SPRING THERMAL BAR PERIOD,
State Univ. of New York Coll. at Buffalo. Great Lakes Lab.
G. J. Lorefice, and M. Munawar.
In: International Association Great Lakes Research, Proceedings 17th Conference Great Lakes Research, p 619-628, 1974. 3 fig, 4 tab, 25 ref. EPA R 800701.

Descriptors: *Lake Ontario, *Seasonal, *Thermal stratification, *Thermal properties, *Diatoms, Great Lakes, International commissions, On-site data collections, Spatial distribution, Phytoplankton.
Identifiers: *Thermal bar period, Niagara River.

Analysis of phytoplankton collected from 45 stations on the southwestern nearshore of Lake Ontario during cruises in spring 1972 and compared with thermal bar analysis of the area suggest that the thermal bar might have acted as a barrier to water movement as indicated by the temperature contours found around the mouth of the Niagara River, where the river water 'pushed out' the 3C, 4C, and 5C isotherms and yet appeared to have not broken through. Phytoplankton was counted with an inverted microscope and total phytoplankton was counted at the 45 sampling stations. During the investigation period, the thermal bar remained within the study area. In April it stayed shoreward of the 4-km station, dipping into and out of the shore. By May it had advanced farther out but in most cases to less than 8 kms. In close agreement to the movement of the thermal bar, average biomass was greatest at the 1/2 and 4-km stations and low at the 8-km distance from shore. During April the 1/2-km stations had double the biomass as the 4-km stations and quadruple the biomass of the 8-km stations. In May the 1/2-km stations had half as more biomass than the 4-km stations and three as much as at the 8-km stations. Diatoms also showed an inshore to offshore decreasing trend for both periods except in the vicinity of the Niagara River mouth. (Harris-Wisconsin)
W77-10741

CONVERSION OF 1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE (DDT) TO WATER-SOLUBLE PRODUCTS BY MICROORGANISMS,
Cornell Univ., Ithaca, N.Y. Lab. of Soil Microbiology.
F. W. Juengst, and M. Alexander.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-A024 692, Price codes: A02 in paper copy, A01 in microfiche. Agricultural and Food Chemistry, Vol. 24, No. 1, p 111-115, 1976. 1 fig, 1 tab, 19 ref. N00014-67A-0077-0027, Nr 306-067.

Descriptors: *DDT, *Biodegradation, *Aquatic microorganisms, *Sea water, Water pollution sources, Microbial degradation, Model studies.
Identifiers: *Mucor alternans.

In efforts to learn if water-soluble compounds represent new groups of DDT metabolites generated by pathways of chemical or biodegradation not previously found, a study was made of the possible synthesis of water-soluble products from DDT by marine microorganisms and attempts were made to characterize the water-soluble metabolites formed from the insecticide by Mucor alternans. Forty-three percent of the bacteria, isolated from sea water and marine sediments, converted 5-10% of the DDT in the test to water soluble products and 35% of the bacteria transformed less than 5% of the insecticide to water-soluble metabolites. Several of these compounds so generated by the action of M. alternans were partially characterized in the investigation and found to be different from known products of DDT metabolism. But no conversion took place in models made of marine ecosystems which were supplemented with a large number of organic compounds and incubated aerobically, anaerobically and with supplemental inorganic nutrients. The evidence presented here suggests that the water-soluble compounds produced by M. alternans are distinct from known DDT metabolites. In addition, at least three components are apparently present, and they may all be acids. If chlorine is in fact absent from these compounds, they may be generated by a pathway involving the most extensive degradation of DDT so far reported by a single organism, since all products described to date contain chlorine. (Harris-Wisconsin)
W77-10742

INFLUENCE OF SEDIMENT INFLOW IN PHYTOPLANKTON PRIMARY PRODUCTIVITY IN LAKE TAHOE (CALIFORNIA-NEVADA),
California Univ., Davis. Div. of Environmental Studies.
M. M. Tilzer, C. R. Goldman, R. C. Richards, and R. C. Wrighey.
Internationale Revue der Gesamten Hydrobiologie, Vol. 61, No. 2, p 169-181, 1976. 5 fig, 7 tab, 32 ref.

Descriptors: *Lake sediments, *Primary productivity, *Photosynthesis, *Sediment load, *Nutrients, Light penetration, Phytoplankton, Chlorophyll, California, Eutrophication, Iron, Sediment distribution, Sediment transport, Sediment discharge, Suspended solids, Light intensity, Nevada.
Identifiers: Lake Tahoe(Calif-Nev), Sediment density.

The effects of both dissolved and particulate allochthonous materials on phytoplankton primary productivity were studies under conditions of reduced underwater light intensities and higher nutrient concentrations in a Lake Tahoe sediment plume during maximum spring runoff. Nutrient concentrations in the plume increased in proportion to sediment density whereas light transmission of the water was reduced with little effect on the spectral composition except for red light. Comparison with clear lake water conditions showed that light inhibition of photosynthesis at the lake surface was less pronounced in the plume than in clear water and light limitation occurred more rapidly in deeper layers. Lake experiments and laboratory bioassay results suggested that iron had the greatest stimulatory effect on both photosynthetic activity and biomass growth at maximum sediment densities. It was concluded that: (1) Increased turbidity reduces integral photosynthesis though this effect is diminished by less surface light inhibition, (2) increased nutrient inputs lead to higher primary productivity, and (3) the effects of combined sediment and nutrients inputs is dependent on the increase of the biomass relative to the increase of non-living seston in influencing the portion of underwater light which is absorbed and utilized by the photosynthetic pigments of the algae. (Luedtke-Wisconsin)
W77-10743

CHEMISTRY AND VEGETATION OF HIGHLY ACIDIC STREAMS,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W77-10744

THE TOXICITY TO FISH OF HERBICIDES RECOMMENDED FOR WEED CONTROL IN THE REWA,
University of the South Pacific, Suva (Fiji). School of Natural Resources.
L. T. Sun, and M. L. Gorman.
Fiji Agric J. 35(1), p 31-33, 1973.

Descriptors: *Toxicity, *Herbicides, Fish, *Aquatic weed control, Copper sulfate, *Paraquat, *Diquat, Water pollution effects, Asia, Pacific Ocean.
Identifiers: Fijii(Rewa River), *Poecilia-mexicana.

Laboratory tests of the toxicity to fish (test species Poecilia mexicana) of a herbicide mixture recommended for water-weed control in the Rewa river showed the copper sulfate component to be highly toxic and the diquat (paraquat in the tests) the copper sulfate component to be highly toxic and the diquat (paraquat in the tests) component less so.--Copyright 1974, Biological Abstracts, Inc.
W77-10745

SURVEY OF INDUSTRIAL PROCESSING DATA. TASK II--POLLUTION POTENTIAL OF POLYBROMINATED BIPHENYLS,
Midwest Research Inst., Kansas City, Mo.

For primary bibliographic entry see Field 5B.
W77-10750

WATER POLLUTION AND HUMAN HEALTH,
Ohio Univ., Athens. Dept. of Economics.
R. K. Koshal.
Water, Air, and Soil Pollution, Vol 5, p 289-297, 1976. 5 tab, 26 ref, append.

Descriptors: *Public health, *Water purification, *Water pollution effects, Water supply, Water treatment, Bacteria, Water pollution, Mortality, Morbidity, Statistical methods, Regression analysis, Diseases, Human diseases, Organic matter, *Model studies.
Identifiers: Kidney infection, Sclerosis, Nephritis, Nephrosis, Solid particulates.

A statistical model is offered as a uniform measure of judging the quality of water and to study the effect of bacteria and solid particle water pollution on mortality rates of diseases which are primarily caused by water pollution. The model relates mortality rates from disease by water pollution caused to the level of 'pure' water used by the population in a state measured by the percentage of households using publicly-supplied water, race, sex, and age composition. Using three-year data from 48 states centered around the 1970 census year and applying a multiple regression technique, statistical results are obtained for sclerosis, kidney infections, and nephritis and nephrosis. It is shown that a ten-point increase in the percentage of households using public water, ceteris paribus, would decrease the death rate by 2.4 due to kidney infection, by 2.3 due to sclerosis, and by 1.7 due to nephritis and nephrosis. While data limitations and limits in the present technical knowledge about water pollution and its effects make these results suggestive rather than conclusive, they have broad implications particularly for developing nations where a small proportion of the population is served by publicly supplied water. (Luedtke-Wisconsin).
W77-10751

ORTHOPHOSPHATE TURNOVER IN EAST AFRICAN LAKES,
Munich Univ. (West Germany). Zoologisches Institut.
R. H. Peters, and S. MacIntyre.
Oecologia, Vol 25, No 4, p. 313-319. 1976. 3 fig, 2 tab, 23 ref.

Descriptors: Seston, *Africa, Lakes, *Phosphorus, *Cycling nutrients, Analytical techniques, Absorption, *Phosphates, Pollutant identification, Bioassay.
Identifiers: *Orthophosphates, *Turnover rate(Nutrients), *Nutrient availability, Kenya, Soluble reactive phosphorus.

In an investigation in which uptake kinetics were measured as an alternative using a nutrient bioassay for gauging nutrient availability, turnover rates of 32P-P04 and concentrations of chemically-determined orthophosphate as soluble reactive phosphorus (SRP) are reported for five East African Lakes. Concentrations of SRP in surface waters ranged from 2,000 micrograms P/L to less than 3 micrograms/l. Lake Elmenteita, the main basin of Lake Naivasha, and Naivasha Crater Lake had rapid turnover rates and very little supply of orthophosphate. Turnover was slow and orthophosphate concentration high in both Lake Nakuru and the Crescent Island Crater basin of Lake Naivasha with an average rate of 0.0023/min in Lake Nakuru and no significant uptake observed in Crescent Island Crater basin. The contention that a large quantity of orthophosphate is available for algal growth was tested in Lake Nakuru by two further experiments. Results indicated that colloidal binding of orthophosphate was limited and that particles retained by an 8.0 micro filter incorporated 66% as much tracer as particles retained by a 0.1 micro filter. (Luedtke-Wisconsin).
W77-10752

NITROGEN UPTAKE AND RELEASE IN A FORESTED WATERSHED, LAKE TAHOE BASIN, CALIFORNIA,
California Univ., Davis. Div. of Environmental Studies.
R. N. Coats, R. L. Leonard, and C. R. Goldman.
Ecology, Vol 57, No 5, p. 995-1004, 1976. 8 fig, 2 tab, 29 ref. NSF GI-22.

Descriptors: *Nitrification, *Water quality, *Forest watersheds, *California, Soil water, Nitrogen cycle, Nitrogen, Ammonia, Nutrient removal, Precipitation(Atmospheric), Snowmelt, Forest soils, Coniferous forests, Streams, Runoff, Absorption, Land use, Watershed management.
Identifiers: Lake Tahoe(Calif), Land disturbances.

The role of soils in modifying water quality in a watershed of the Lake Tahoe basin, California was studied to relate water quality to land disturbance and to provide basic information on the nitrogen cycle in a coniferous forest ecosystem. Samples of precipitation and soil and stream water were collected and analyzed for NO3-N, NH4-N and to a lesser degree, dissolved organic nitrogen. Factors controlling nitrification in selected plots were studied using a soil perfusion technique. Results indicate that inorganic nitrogen input to the watershed by precipitation is 1-2kg/ha/yr. Output to the lake is 10-30% of the input. Inorganic nitrogen is removed from snowmelt water almost totally by well-developed conifer stands but less efficiently by poorly developed or disturbed stands. Alder stands release NO3-N to soil water, particularly in fall and early winter. Nitrification occurs in some coniferous forest soils and closely associated with NO3-N release. Significant nitrification is related more to the C:N ratio and stand basal area than to pH or release of toxic substances by decaying litter. (Luedtke-Wisconsin)
W77-10753

IN VIVO EXCRETIONS OF THE BLUE-GREEN ALGAE ANACYSTIS NIDULANS AND SYNECHOCYSTIS AQUATILIS IN MONO- AND MIXED CULTURES,
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
G. A. Karaush, and V. D. Fedorov.
Soviet Plant Physiology, Vol. 22, No. 3, p. 510-516, May-June 1975. 2 fig., 1 tab., 12 ref.

Descriptors: *Cyanophyta, *Algae, Cultures, Metabolism, Biochemistry, Chemical properties, Carbohydrates, Lipids, Amino acids, Organic acids, Nutrient requirements.
Identifiers: *Mixed cultures, *Photoheterotrophic metabolism, *Anacystis nidulans, *Synechocystis aquatilis, Filtrates, In-vivo excretions.

The content of carbohydrates, organic acids, amino acids, and lipids in filtrates of monocultures of the blue-green alga Anacystis nidulans and Synechocystis aquatilis and their mixtures was determined, to STET on the interrelationship between these cyanophyta in mixed cultures. Protein was not detected in any of the filtrates of investigated algal cultures. Results indicated that predominantly nitrogen containing compounds and lipids as well as carbohydrates accumulated in filtrates of A. nidulans before mineral nitrogen and phosphorus were exhausted from the medium. These compounds were then used by the culture as a source nitrogen after the mineral nitrogen from the medium was exhausted. Cultures of S. aquatilis primarily excreted organic acids as long as mineral nitrogen and phosphorus were present in the medium. However, after their exhaustion, the organic substances accumulated in the filtrate were not used by the culture. In mixed cultures, it is suggested that photoheterotrophic metabolism A. nidulans essentially utilizes the carbohydrate, organic acids, and lipid components of S. aquatilis and ultimately displaces the more autotrophic species. (Luedtke-Wisconsin)
W77-10755

SUMMER ZOOPLANKTON DISTRIBUTION IN A GEORGIA ESTUARY,
Skidaway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, and S. C. Knowles.
Marine Biology, Vol. 33, No. 2, p. 147-154, 1975. 4 fig., 1 tab., 11 ref. NSF GX-33615.

Descriptors: *Zooplankton, *Distribution, *Diurnal distribution, *Estuaries, *Georgia, Distribution patterns, Tidal waters, Summer, Light, Fish food organisms, Baseline studies.
Identifiers: *Acartia tonsa, *Copepod nauplii.

Distribution of zooplankton in the water column was studied as a way of assessing their utilization by the fish community as well as to provide baseline data on the zooplankton community of northern Georgia estuaries. Zooplankton were collected with Van Dorn bottles at two estuarine stations, at the surface, at two meters and at four meters depth, and at the bottom of the water column at two hour intervals for 11 days. Acartia tonsa was most concentrated at the surface at night and during high and rising tide but was more evenly depth distributed during day time, suggesting a negative phototaxic response. On the other hand, copepod nauplii were more abundant in surface waters than near the bottom, during all hours with the greatest concentration occurring during low tide. However, determination could not be made of utilization of the zooplankton community by fish because of the ability of species such as Pseudodiaptomus coronatus, Neomysis americana and other adult forms to escape the Van Dorn bottles. Of the 30 species collected during the sampling program, only A. tonsa and copepod nauplii are discussed quantitatively. (Luedtke-Wisconsin).
W77-10756

PHYSIOLOGICAL STUDIES OF SUBTIDAL RED ALGAE,
New Hampshire Univ., Durham. Dept. of Botany; and Jackson Estuarine Lab.
A. C. Mathieson, and T. L. Norall.
Journal of Experimental Marine Biology and Ecology, Vol. 20, No. 3, December 1975, p. 237-247. 11 fig., 12 ref. N0AA11.

Descriptors: *Photosynthesis, *Light, *Temperature, *Rhodophyta, Optimization, Seasonal, Spatial differences, Depth.
Identifiers: Euthora cristata, Phycodrys rubens, Phyllophora truncata, Ptilota serrata, Subtidal.

Photosynthetic responses of four subtidal red algae were determined under a variety of light and temperature conditions and evaluated for spatial, seasonal, and genetic differences. Optimal light requirements for net phosynthesis were relatively consistent, 465 to 747 ft. c at 5 degrees and 15 degrees C, though tetrasporic Euthora cristata reached a maximum net photosynthesis at 747-1080 ft.-c. Ptilota serrata and Phyllophora truncata increased their light optima with an increase in temperature. Depth and seasonal differences were also found in their photosynthesis-light relationships; winter plants exhibited lower light optima for net photosynthesis than spring plants. Deep-water populations of Ptilota showed lower light optima and reduced net photosynthesis compared with shallow subtidal populations. Photosynthesis-temperature relations of E. cristata, Phycodrys rubens, and Phyllophora truncata varied seasonally; winter plants displayed higher rates of apparent photosynthesis at low temperature, lower temperature optima, and reduced tolerance to high temperatures than summer plants. It is suggested tha optimal light and temperature requirements are adaptively adjusted to the respective New England habitats of the species. (Luedtke-Wisconsin)
W77-10757

LAKE MAHEGA: A MESOTHERIC, SULPHATO-CHLORIDE LAKE IN WESTERN UGANDA,
Duke Univ., Durham. Dept. of Zoology.
J. M. Melack, and P. Kilham.
Afr J Trop Hydrobiol Fish. 2(2), p 141-150, 1972.

Descriptors: Africa, Lakes, *Mesothrophy, *Eutrophication, Bacteria, *Cyanophyta, *Thermal water, *Chlorides, *Sulfates, Ions, Anions, Water chemistry, Sodium.
Identifiers: Inversion(Lake), *Synechococcus-bacillaris, *Uganda(Lake Mahega).

In May, 1971, Lake Mahega had pronounced mesothermy (40.0C at 1 m). Solar heating of a bloom of bacteria and the blue-green alga, Synechococcus bacillaris, probably caused the high temperature. A total ionic concentration gradient increasing from 192,000 mg-1-1 at the surface to 415,200 mg-1-1 at 3 m stabilized the thermally inverted water. Nearly equal amounts of chloride and sulphate accounted for about 90% of the anionic composition. Na was the major cation. Crystals of the triple salt, north-upite (Na2CO3-MgCo3-NaCl) and of thenardite (Na2SO4) were mixed with the surface sediment. It is possible that primary northupite deposition is occurring. Lake Mahegan is also the 1st mesothermic, sulfato-chloride lake reported for East Africa.--Copyright 1974, Biological Abstracts, Inc.
W77-10759

COMPARISON OF BACTERIAL AND ALGAL UTILIZATION OF ORTHOPHOSPHATE IN AN ESTUARINE ENVIRONMENT,
Smithsonian Institution, Edgewater, Md. Chesapeake Bay Center for Environmental Studies.
M. A. Faust, and D. L. Correll.
In: Marine Biology, Vol 34, No 2, 1976, p. 151-162. 5 fig, 3 tab, 27 ref.

Descriptors: *Bacteria, *Algae, *Estuaries, Filtration, Biomass, *Phosphates, Phosphorus, Chesapeake Bay, Filters, *Absorption, Cycling nutrients, Microscopy, *Maryland, Estuarine environment.
Identifiers: Rhode River(Md).

In an effort to overcome lack of information about the role of various microorganisms in the process of phosphorus cycling in estuarine environments, finer-controlled filtration and microscopy was used to distinguish between bacterial and algal utilization of orthophosphate by plankton in the Rhode River sub-estuary of Chesapeake Bay. The differential filtration technique incorporated tests with flow filters of 5.0, 1.2 and 0.45 micrometer pore size. Light microscopy examination revealed that most of the bacterial population passed through a 5.0 micrometer filter while most algae were retained. Phosphorus uptake by algae and bacteria was closely correlated with cell biomass. Phosphorus uptake by algae was high only in the summer months whereas P-uptake was correlated with temperature or dissolved orthophosphate, total organic phosphate or total phosphate concentrations. Algal cell numbers had a high correlation with bacterial cell numbers (0.950) as did the algae and bacteria biomass (0.902) though high standard deviations from the means were found. The rate of P-uptake from water by algae and bacteria varied with season and with the species composition of the natural population. Bacterial and algal cell numbers and biomass were estimated in all experiments. (Luedtke-Wisconsin)
W77-10760

SORPTION AND HYDROLYSIS OF ADDED ORGANIC PHOSPHORUS COMPOUNDS IN LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5B.
W77-10799

5D. Waste Treatment Processes

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W77-10159

PROBLEMS AND POLICY ALTERNATIVES: URBAN AREAS,
Envirex, Milwaukee, Wis.
For primary bibliographic entry see Field 5G.
W77-10160

INFLUENCE OF ORGANIC CARBON AND MICROORGANISMS ON IRON AND SULFIDE CONCENTRATIONS IN GROUNDWATER,
Missouri Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W77-10183

MATERIALS RECOVERY AND ENERGY PRODUCTION FROM SOLID WASTES,
Stellenbosch Univ. (South Africa). Dept. of Chemical Engineering.
M. A. Conner.
Chemsa, Vol. 2, No. 5, p 79-80, May 1976. 2 tab, 12 ref.

Descriptors: *Solid wastes, *Energy, Agricultural wastes, Industrial wastes, Domestic wastes, Fuels, Metals, Economics, Waste disposal, Costs, *Waste treatment.
Identifiers: *South Africa, *Materials recovery, *Energy production(Wastes).

The solid waste treatrment situation in South Africa is considered and the present and future importance of different options is assessed. The emphasis is on materials recovery and energy production and their relationship. It is concluded that integrated energy and materials recovery processes can make a significant contribution to the conservation of energy and certain materials. (So African Water Info Center)
W77-10200

OCCURRENCE AND POSSIBLE USE OF NON-SULPHUR PURPLE BACTERIA IN EFFLUENT TREATMENT PROCESSES,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10207

BIOFLOCCULATION IN THE ACTIVATED SLUDGE PROCESS,
Wessex Water Authority, Bristol (England).
C. F. Forster.
Water SA, Vol. 2, No. 3, p 119-125, July 1976. 5 fig, 5 tab, 36 ref.

Descriptors: *Activated sludge, Proteins, Nucleic acids, Esters, Nitrogen compounds, Surface properties, *Flocculation, Metals, Molecular weight, Enzymes, Field tests, Fractionation, Polymers, Sewage treatment, *Waste water treatment.
Identifiers: *Bioflocculation, Gel filtration, Ultrafiltration.

The nature of the matrix of activated sludge has been investigated by a number of workers who have identified proteins, nucleic acids, poly-esters and poly-saccharides amongst the surface components. All of these polymers are potentially capable of being ionogenic and contributing to the surface charge of the sludge particles. Since the surface charge has been found to be directly related to the sludge settling characteristics, it is obviously important to ascertain how the various components interact and which are the more important. The mechanism for the uptake of metals by the sludge (or the sludge surface polymers) has been shown to depend on whether the polymer is in a fixed (or solid) state or in solution. Treatment of sludge by enzymes (cellulase and lysozyme) was also examined and this tended to confirm the ideas that flocculation is a multi-stage process. (So African Water Info Center)
W77-10208

DISINFECTION OF MUNICIPAL WASTE WATER WITH GAMMA RADIATION,
Johannesburg City Health Services (South Africa).
L. N. Melmed.
Water SA, Vol. 2, No. 3, p 131-135, July 1976. 2 fig, 4 tab, 2 ref.

Descriptors: *Disinfection, *Radiation, *Municipal water, Sewage effluents, Cobalt, Water reuse, Bacteria, Chlorination, Potable water, Ponds, Radioactivity, *Waste water treatment, Sewage treatment, *Gamma rays.
Identifiers: *Johannesburg (South Africa).

Disinfection of sewage effluents by means of gamma radiation, to render them suitable for reclamation and reuse, was investigated. Using Cobalt 60 as the radiation source, laboratory experiments showed that a total radiation dose of 50 krad reduced the E. coli count in settled biological filter effluent from between 2 x 10 to the 6th power and 5 x 10 to the 5th power/100 ml to 1 000/100 ml and the total viable count from 6 x 10 to the 6th power to 4 x 10 to the 3rd power/ml. A total radiation dose of 500 krad could produce a bacteriologically potable water from maturation pond effluent having an original E. coli content of 150/100 ml and a total viable count of 2 x 10 to the 5th power/ml. Preliminary experiments, to detect possible synergistic effects when chlorine and radiation are applied to settled filter effluent simultaneously or in series, were also carried out. The addition of 1 mg/l of chlorine applied simultaneously, or before radiaton, reduced the radiation dose required to produce a water containing 1 000 E coli per 100 ml from 50 krad to 30 krad. (So African Water Info Center)
W77-10210

A REVIEW OF BIOLOGICAL PHOSPHORUS REMOVAL IN THE ACTIVATED SLUDGE PROCESS,
Meiring (P. G. J.) and Partners, Pretoria (South Africa).
J. L. Barnard.
Water SA, Vol. 2, No. 3, p 136-144, July 1976. 9 fig, 12 ref.

Descriptors: *Phosphorus, *Activated sludge, Denitrification, Nitrates, Phosphates, Anaerobic conditions, Sewage treatment, Pilot plants, Oxidation ponds, Retention, Oxidation reduction potential, *Waste water treatment.
Identifiers: South Africa.

The conditions under which phosphate precipitation was observed in the activated sludge process were reviewed. These include phosphate removal in plug-flow systems such as was found in San Antonio, Baltimore and at the Hyperion plant of the City of Los Angeles, in the Pho-strip method and in the Bardenpho method designed originally for denitrification. An anaerobic basin is proposed at the head of those activated sludge plants in which either no nitrification takes place or nitrates are denitrified. The clarifier underflow and the feed can then be mixed in this basin in order to induce the anaerobic conditions required for phosphate removal. This basin is then followed by either an aeration basin in which no nitrification is allowed to take place, or is followed by a series of anoxic and aerobic basins for nitrification and denitrification. In either process, the mixed liquor would need to be aerated to a dissolved oxygen level of between 2 to 4 mg/l before passing it into the final clarifier. (So African Water Info Center)

W77-10211

PIETERMARITZBURG'S NEW SEWAGE PURIFICATION FACILITIES,
Pietermaritzburg City Engineer's Dept. (South Africa).
D. V. Harris.
Municipal Engineer, Vol. 7, No. 5, p 63-67, 1976. 4 illus.

Descriptors: *Sewage treatment, *Sludge digestion, *Activated sludge, Screening, Settling tanks, Sludge thickening, Chlorination, Methane, Scum, Remote control, Incineration, *Waste water treatment, *Treatment facilities.
Identifiers: South Africa, Umsindusi River, *Pietermaritzburg(South Africa).

The Darvill Sewage Purification Works has been extended from a capacity of 27 Ml per day in twenty years. The new egg-shaped high rate digestors are the first to be constructed in Southern Africa. Design features and a description of the plant are given. (So African Water Info Center)
W77-10212

A SANITARY ENGINEER'S VIEWPOINT ON TALL BUILDINGS,
Murray (Alex) Pty Ltd., Durban (South Africa).
For primary bibliographic entry see Field 8A.
W77-10213

THE KWA DABEKA-CLERMONT SEWERAGE SCHEME-PLANNING, DESIGN AND OPERATION,
Theron (J. C.), Burke and Isaac, Inc. (South Africa).
G. F. Antoni.
Municipal Engineer, Vol. 7, No. 1, p 37-41, 1976. 3 fig. map, 2 ref.

Descriptors: *Design, *Waste water treatment, Sites, Industrial wastes, Housing, Planning, Sewage treatment, Sewerage, Sewers, Design data, Capital costs, Sludge treatment, Waste disposal, Sewage, *Operations.
Identifiers: *South Africa, Kwa Zulu, Kwa Dabeka, Clermont.

A new housing development with an estimated ultimate population of 80 000 and an existing adjoining township of 30 000 will be served by the new sewerage scheme. The early planning, final design and plant selection, cost comparisons and operating problems of the sewerage scheme and associated works are described. (So African Water Info Center)
W77-10220

POSSIBILITIES OF RECYCLING IN SOUTH AFRICA, CHOICES AND CONFLICTS,
Johannesburg City Council (South Africa). Dept. of Health Services.
V. Bolitho.
Municipal Engineer, Vol. 7, No. 1, p 19-21, 1976. 1 tab.

Descriptors: *Recycling, Municipal wastes, Waste disposal, Solid wastes, Incineration, Landfills, Costs, Planning, Transportation, Economics, Administration, *Water reuse.
Identifiers: *South Africa.

The re-use of waste components, net cost of alternative disposal processes, and methods of limiting the quantities of waste are discussed. Urban planning, transportation, and regional administration of waste collection and disposal are investigated. It is concluded that there are irreconcilable conflicts between potential reclamation techniques, and that conceptual models must be developed to indicate the direction of change of economic and resource relationships. The most sensible and economic direct recycling procedure in the immediate future will be the reclamation of derelict land and the creation of recreation areas. (So African Water Info Center)
W77-10221

FISH WATER FLATS RECLAMATION WORKS.
Municipal Engineer, Vol. 7, No. 1, p 55-59, 1976. 3 illust.

Descriptors: *Sewage treatment, *Water reuse, Sewage disposal, Sewerage, Aeration, Pumping stations, Operating capacity, Aeration tanks, Settling tanks, Mechanical equipment, Thickeners, Scrubbers, Detritus, Equipment, *Treatment facilities, *Waste water treatment.
Identifiers: South Africa, *Port Elizabeth(South Africa).

The Port Elizabeth Municipality's sewerage water reclamation works, situated at Fish Water Flats near the Swartkops River mouth, is nearing completion. The commissioning is expected to start early this year. This project is not only one of the largest works to be constructed in one stage in Southern Africa, but is also one of the largest single schemes which the Port Elizabeth Council has undertaken. The operation, cost, and mechanical equipment of the plant are described. (So African Water Info Center)
W77-10222

CONTROL OF ALGAE IN LAKES, LAGOONS AND SMALL RESERVOIRS WITH BIOGROWTH PARTITIONS,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-10268

MODELLING, SIMULATION AND CONTROL OF STOCHASTIC SYSTEMS WITH APPLICATIONS IN WASTEWATER TREATMENT,
Oxford Univ. (England). Dept. of Engineering Science.
C. J. Harris.
International Journal of Systems Science, Vol. 8, No. 4, April 1977, p 393-411. 8 fig, 19 ref.

Descriptors: *Waste water treatment, *Simulation analysis, *Algorithms, *Water quality control, *Stochastic processes, *Activated sludge, Markov processes, Biological treatment, Sewage treatment, Biochemical oxygen demand, Evaluation, Optimization, Equations, Mathematical models, Systems analysis.
Identifiers: *Nonlinear programming, Cost minimization.

A first-order simulation algorithm for multivariable nonlinear stochastic integral equations of the Ito type is derived, which utilizes the second-order properties of incremental Brownian motion. Various questions of stability and convergence of the algorithm are investigated. By way of application, the algorithm is used in evaluating models and optimal control laws for biological wastewater treatment plants of the activated sludge type. Objective functions include cost minimization and the minimization of plant output (effluent) biochemical oxygen demand concentration. It is concluded that whatever control algorithm is used, the simulation algorithm presented enables the controllers' regulation capabilities to be investigated without recourse to solving the dynamic equations explicity. (Bell-Cornell)
W77-10294

AQ. DETERGENT EFFLUENT PURIFICN. - BY EXTN. USING 4 TO 20 CARBON ALCOHOL(S) OR THEIR ESTERS OR ETHERS.
French Patent FR 2319-585. Issued January 4, 1977. Derwent French Patents Abstracts, Vol. Y, No. 19, p D15, June, 1977.

Descriptors: *Detergents, *Foaming, *Separation techniques, *Solvent extractions, *Surfactants, *Waste water treatment, Chemical wastes, Liquid wastes, *Patents.

A patent for a purification process which removes up to 99.5% of the detergent from effluent containing nonionic and/or cationic detergents is described. Liquid-liquid extraction at 20-100 C, especially at 60-80 C, using 4-20 carbon alcohols or mixtures with their esters or ethers is used. Optically branched 8-10 carbon alcohols, and the adipates, sebacates, phthalates, maleates, and fumarates of 4-20 carbon alcohols are the preferred solvents. The described process is useful in reducing COD of effluent from detergent, minimizing foaming, and reducing pollution. (Schulz-FIRL)
W77-10335

THE TREATMENT OF TOXIC EFFLUENTS: INVESTIGATIONS BY THE BCRA,
R. L. Cooper.
Effluent Water Treatment Journal, Vol. 17, No. 5, p 230-237, May, 1977. 16 ref.

Descriptors: *Waste water treatment, *Waste treatment, *Activated sludge, *Biological treatment, *Oxidation, *Sludge digestion, *Microbial degradation, Chemical wastes, Sludge treatment, Sludge disposal, Biodegradation, Analytical techniques, Design criteria, Aeration.

The British Carbonization Research Association (BCRA) has investigated biological treatment methods for the disposal of a wide variety of effluents, particularly strong and toxic industrial wastes. Studies by the BCRA since 1955 have led to the conclusion that the activated-sludge process, when accompanied by adequate surface aeration and mixing, is the most efficient method for treatment of wastes produced by the carbonization of coal in steel production. Because many of the constituents of carbonization wastes are lethal to bacteria, biological oxidation may be inhibited unless aeration and mixing are sufficient to lower levels of toxic constituents in all parts of the aeration tank. As this has not always been accomplished at older plants, the BCRA has developed a comprehensive design profile for treatment of particular effluents so that optimal design features can be incorporated into future waste treatment plants. The BCRA has also investigated other methods of biological treatment, including the conventional percolating filter, rotary biologic contactors, and tower processes. It was concluded that these processes are not generally as advantageous from a cost/benefit standpoint as the activated-sludge process. The BCRA has also assessed existing methods for the chemical analysis of effluents and has developed procedural guidelines for the analysis of water, sewage, effluents, and their associated sludges and sediments. (Schulz-FIRL)
W77-10336

PROCESSING OF INDUSTRIAL WASTE FOR SOLAR EVAPORATION,
Pacific Disposal Systems, Inc., Martinez, Calif.
V. R. Johnson.
AIChE Symposium Series, Vol. 73, No. 162, p 74-76, 1977.

Descriptors: *Evaporation, *Ponding, *Water quality control, Industrial wastes, Waste water treatment, Air pollution, Flooding, Percolation, Levees, Waste disposal.
Identifiers: *Solar evaporation.

Where land costs are low and when proper planning is used, solar evaporation can be the most economical waste water volumetric reduction and disposal method available that meets current air and water standards. Water quality control or protection from percolation, flooding, and levee failure is handled primarily by selection of a site with natural protection against horizontal and ver-

tical movements of pond water into the groundwater. Construction of perimeter monitoring wells for rapid detection of any percolations, well-engineered levees, and monitors on the levels of incoming water are also necessary. Air pollution control is a real problem. Incoming materials must be controlled to eliminate direct volatilization of undesirable input components and/or incompatible biological or chemical reactions between incoming and current wastes. The lab equipment needed for analysis of wastes is discussed. Certain wastes must first be treated to a form which is compatible with current pond composition or can be handled by other disposal means. Particular problems noted include: hydrocarbons, sulfur compounds, nitric and hydrofluoric acids, and organic overloads. Possible solutions are suggested. (Pfeifer-FIRL)
W77-10337

ULTRAFILTRATION--THE CURRENT STATE OF THE ART,
Abcor Environmental Systems, Ltd., Surbiton (England).
P. A. Bailey.
Filtration and Separation, Vol. 14, No. 3, p 213-219, May/June 1977. 6 fig, 2 tab.

Descriptors: *Effluents, *Filtration, *Membrane processes, *Waste water treatment, Industrial wastes, Food processing industry, Chemical industry, Chemical wastes, Reviews.
Identifiers: *Ultrafiltration, Recovery.

Ultrafiltration has become an important waste treatment technique, applied in a large variety of industries with potential for expansion into still others. A feed liquid is passed across the surface of a semipermeable membrane with the water or other liquid carrier permeating through the membrane, concentrating the waste particles as the liquid passes over more membrane surface. This technique is effective in filtering submicron particles and large dissolved molecules. Not only can effluent be treated by this technique, but a valuable component may also be recovered. A variety of membrane materials and configurations has been developed to be chosen according to the specific needs of the user. Characteristics of these various configurations and materials are discussed. Major industrial applications of ultrafiltration are: recovery of electrophoretic paint; cleaning of effluents from pulp mill, food processing, and textile waste waters; latex concentration from wash water of synthetic rubber manufacturers; recovery of oil from oil/water emulsions used in metal-forming operations; and recovery of alkaline cleansing baths. (Pfeifer-FIRL)
W77-10338

REMOVING CARBOXYLIC ACIDS FROM AQUEOUS WASTES,
Hydroscience Environmental Systems, Knoxville, Tenn.
R. W. Helsel.
Chemical Engineering Progress, Vol. 73, No. 5, p 55-59, May, 1977. 5 fig, 2 tab.

Descriptors: *Acids, *Chemical wastes, *Reclamation, *Separation techniques, *Distillation, Solvent extractions, Industrial wastes, *Waste water treatment.
Identifiers: *Carboxylic acids.

The disposal of waste waters containing acetic acid, one of the most widely-used industrial organic acids, has been recognized as a significant expense. For that reason the recovery of carboxylic acids, in particular acetic acid, is economically advantageous. A review of existing methods of physical separation of acetic acid from waste water is presented. Available techniques include: fractionation distillation, solvent extraction using low- and high-boiling solvents, extraction distillation, carbon adsorption, and combination processes. A new method for extracting carboxylic acids from dilute aqueous solutions using trioctylphosphine oxide (TOPO) as a chemical extractant is described. TOPO has also been used in metal extraction. Extraction by TOPO is a four part process, involving conventional solvent extraction; removal of water by solvent stripping distillation; distillation of the partially dehydrated extract to remove the majority of the acid and the remainder of the water; and distillation to separate the concentrated glacial acetic acid from the second stripping column distillate. Advantages of the TOPO system include the need for relatively small volumes of solvent; low water miscibility in the system; high degree of phase separation in the system, which allows for smaller extraction equipment; and stability and high boiling point of solvent. Total recovery costs for a 2% acid stream of 200 gal/min from which 90% of the acid is recovered are given as 6.3cent/lb. The recovery of other low molecular weight acids is suggested to make the TOPO method more economically attractive. (Schulz-FIRL)
W77-10339

REDUCING PHOTOPROCESSING WASTES THROUGH REUSE AND RECYCLING,
Weston Environmental Consultants-Designers, New York, N.Y.
P. A. Haderer, and J. A. DeFilippi.
Industrial Photography, Vol. 26, No. 6, p 22-23, 42-45, June, 1977. 1 fig, 3 tab, 6 ref.

Descriptors: *Chemical wastes, *Silver, *Cyanide, *Bleaching wastes, *Photography, Industrial wastes, Reclamation, Metals, Treatment facilities, Electrochemistry, *Waste water treatment, *Recycling.
Identifiers: *Photoprocessing wastes, Ferrocyanide.

BPCTCA (Best practicable control technology currently available) limitations for 1977 have necessitated the reduction of silver, cyanide, and bleach in waste waters discharged by photoprocessors. Based on present practices, it is suggested that photoprocessors can best meet these federal guidelines for Ag and Cn concentrations by in-house processing. Methods for desilvering waste waters generated during various phases of photoprocessing include metallic replacement and electrolyte recovery. Metallic replacement, used by small or average size photoprocessors, involves the solid displacement of a less active metal such as iron or zinc by silver in a solution containing silver thiosulfate complexes. An in-line electrolyte recirculation system is considered for silver recovery from fix bath overflow. Electrolyte recovery involves electroplating of silver in a solution onto a cathode for later stripping to recover pure silver plate. Methods of bleach regeneration, to convert ferrocyanide back to ferricyanide for the bleaches used in color processing, include ozonation, oxidation, and reaction with potassium persulfate. Total costs for silver recovery and bleach regeneration facilities for an average size plant with a flow of 12,000 gal/day are estimated at $11,750. (Schulz-FIRL)
W77-10340

RECYCLING BISULFITE BRINES USED IN SWEET CHERRY PROCESSING,
Eastern Regional Research Center, Philadelphia, Pa.
O. Panasiuk, G. M. Sapers, and L. R. Ross.
Journal of Food Science, Vol. 42, No. 4, p 953-957, July-August, 1977. 3 fig, 7 tab.

Descriptors: *Sulfite liquors, *Brine disposal, *Food processing industry, *Sulfur compounds, *Canneries, Activated carbon, Liquid wastes, Industrial wastes, Fruit crops, Reclamation, *Waste water treatment, *Recycling, Water reuse.
Identifiers: Cherries, Sulfur dioxide.

Problems associated with the disposal of strong calcium bisulfite brines used in the cherry processing industry have led to an evaluation of recycling as a means of alleviating pollution caused by residual SO2 in the brines. Preliminary experiments using activated carbon treatment, sand filtration, and addition of SO2 and lime have produced a product similar in composition, color, and firmness to that of fresh brines. Iron contamination of the recycled brine and resulting discoloration are attributed to corrosion of the steel drums in which the brine was stored. Discoloration caused by iron contamination was not apparent in brines which had been adjusted to 15,000 ppm SO2 or had been stored for 21 weeks at room temperature. To minimize loss of SO2, it is suggested that brines which are to be recycled be prepared immediately before the harvest. Brined cherries which had been repacked in water for shipping to finishers showed oxidation and softening after long term storage. It is suggested that an engineering study and cost analysis being conducted at Michigan State University will provide data on the economic feasibility of brine reclamation. (Schulz-FIRL)
W77-10341

ENERGY RECOVERY IN BREWERY INDUSTRY,
Abshoor Engineers, Tehran (Iran).
I. Kormi, and J. D. Keenan.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE3, p 445-458, June, 1977. 8 tab, 14 ref, 3 append.

Descriptors: *Anaerobic digestion, *Methane, *Industrial wastes, Fixed costs, *Waste water treatment, Energy, Water pollution control, Energy conversion.
Identifiers: Breweries, *Brewery wastes, *Energy recovery(Industrial).

Anaerobic digestion of organic refuse from breweries can provide a clean source of energy, methane gas, in amounts that would account for 17% of that industry's needs. This operation would beneficial environmentally as well: reducing BOD levels of discharged waste waters; recovering heat content of liquid wastes and cooling water for the maintenance of anaerobic treatment temperatures (37 C), thus eliminating thermal pollution problems; and conserving limited energy reserves. Microbial biomass generated by digestion could be sold as a high-protein animal feed just as brewery grain wastes, the substrate for this digestion, are currently being marketed, though at lower prices due to their lesser protein content. Two types of factors affect costs of the methane produced. Fixed costs, which vary with time and locality, include construction, maintenance, and operation costs. Fixed costs are a function of quantity of organic material available for digestion, loading rate, and detention time. Input costs refer to costs of residual grain waste currently sold as feed and credit gained through sale of the more valuable biomass generated by the digestion. When the market price for the biomass reaches $220/ton, methane production is shown to be advantageous to the large brewery. At $265/ton methane is being provided free. Fixed costs can be manipulated for optimum gain. A loading rate of 6 g/liter per day and a 10-day detention time were found most advantageous. Methane production under these conditions is 4.8 liters/gram of substrate added. (Pfeifer-FIRL)
W77-10342

MEETING EFFLUENT DISCHARGE REQUIREMENTS AND WATER REUSE,
Eutek Inc., Sacramento, Calif.
G. E. Wilson, and J. Y. C. Huang.
Food Technology, Vol. 31, No. 6, p 26-31, June, 1977. 8 fig, 3 tab.

Descriptors: *Food processing, *Carrots, Filters, Water pollution control, *Waste water treatment, Industrial wastes, *Water reuse, *Water quality standards.

Identifiers: Waste water management, Pilot studies.

The Federal Water Pollution Control Act Amendments of 1972 comprise far-reaching legislation requiring major responses from industry. With any industry waste water management program, the goal must be the development of performance-guaranteed waste water treatment at best costs. Alternatives in formulating a program are exemplified in the development of a phased program by a carrot processor. The three-phased program included: evaluation of soil solids removal and water reuse systems; pilot evaluation of the system for suspended and colloidal solids rinse; and design, installation, and startup of full-scale solids removal and water reuse. The system used consisted of a 500 gpm teacup solids separator which produced dense settled solids and discharged water containing primarily colloidal particles. These could be removed by a decayed gradient flocculating/gravity clarifier and a coarse media contact filter. A cationic polymer coagulant was injected immediately upstream of the filter. Tests were conducted to determine the optimum filter medium. Reductions of all parameters was noted at each step of the process and water was suitable for reuse and discharge. The operation demonstrates the effectiveness and economy of a phased approach for developing waste management programs. (Pfeifer-FIRL)
W77-10343

PROCESSING OF FACTORY WASTE BY REVERSE OSMOSIS,
Amalgamated Sugar Co., Ogden, Utah.
T. H. Henscheid, A. Matheson, and K. Schoenrock.
The Sugar Journal, Vol. 39, No. 12, p 20-24, May, 1977. 10 fig, 4 tab, 4 ref.

Descriptors: *Reverse osmosis, *Filtration, *Food processing industry, *Ion exchange, *Membranes, Osmosis, Chemical wastes, *Waste water treatment, Sugar beets.
Identifiers: *Steffen filtrate, *Ultrafiltration, *Sugar processing wastes.

A method for the treatment of ion exchange waste and Steffen filtrate using reverse osmosis and ultrafiltration has been devised in studies at the Amalgamated Sugar Company. Various types of membranes and the Dow hollow fiber cartridge were tested for their ability to concentrate Steffen filtrate, which contains roughly 75% organic matter and 25% inorganic ash constituents. Parameters considered were BOD, color, K, Na, Ca, conductivity, ash, organics, RDS, and oven dry. The Dow cartridge attained a greater than 90% rejection rate for all parameters. Various parameters which affect reverse osmosis include pressure, feed concentration, pH, temperature, and contact time. Most efficient reverse osmosis is reported at low osmotic pressures which are a result of very dilute solutions. A multi-stage operation combining reverse osmosis with additional membrane filtration seems necessary to attain complete fractionation of waste. (Schulz-FIRL)
W77-10344

NATIONAL EFFLUENT REQUIREMENTS FOR THE MEAT AND POULTRY INDUSTRY,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
J. M. Haskill.
Food in Canada, Vol. 37, No. 5, p 29-31, May, 1977. 1 tab.

Descriptors: *Food processing industry, *Industrial plants, *Industrial wastes, Waste treatment, Waste water treatment, Water quality control, Effluents, Water utilization, Water reuse, *Canada, *Water quality standards.
Identifiers: *Meat products industry.

Canadian government regulations for control of water disposal by the meat products industry are discussed by Environment Canada. These regulations were developed to meet the need for control of an industry with heavy water use (12.1 million gal/day) combined with the potential for high strength discharge. Federal regulations exist for new and expanded plants, while current plants and environmental agencies together formulate guidelines for the upgrading of their water discharge and use. This legislation was the result of careful consideration of the current industry situation and of the best available technology, both in efficiency and economic viability. The following are recommended as the best possible technology for the meat products industry: blood recovery, low temperature rendering, extensive dry cleanup prior to washing, recycling of water, and good housekeeping practices. The major analytical parameters which industry must report are: BOD, suspended solids, grease, pH, and ammonia nitrogen. Implementation of this legislation is the responsibility of the provincial government with oversight by the Regional Offices of Environmental Protection Services. Periodic industry and government tests are required and frank exchange between industry and government is encouraged. (Pfeifer-FIRL)
W77-10345

TREATING METAL FORGING AND PROCESSING WASTEWATER,
Engineering-Science, Inc., Atlanta, Ga.
M. R. Hockenbury, and A. W. Loven.
Industrial Wastes, Vol. 23, No. 3, p 45-49, May/June, 1977. 5 fig, 4 tab, 6 ref.

Descriptors: *Oily water, *Acids, *Heavy metals, *Industrial wastes, *Waste water treatment, Waste treatment, Chemical precipitation.
Identifiers: Forge wastes, *Metal processing wastes.

Four types of waste water with widely varying characteristics and treatment requirements are produced by a large metal forging and processing facility: forge shop waste water containing varying quantities of suspended solids, oil, and grease; emulsified oily waste water from a hydraulic power system; chemical rinse water with heavy metal ions and other inorganic ions from acid and caustic; and spent acids and caustic. Simple gravity separation of pollutants from forge shop waste water was not effective. Alum or ferric sulfate (20 mg/liter) can be most effective in furthering solid sedimentation, although suspended solids containing oil droplets continued to show no settling. Final treatment involved use of an API-type oil/water separator for removal of free, floatable oil and grease; treatment with the coagulants; and dissolved air flotation. Emulsified oily waste waters were treated using ferric sulfate at low pH as a reliable method for splitting emulsified oily wastes. Treatment of chemical rinse water involved a series of processes: equalization, lime addition, coagulation, pH adjustment, and clarification. Lime (500 mg/liter) raised the pH and provided calcium for precipitation of fluoride ions. Addition of 1 mg/liter of an anionic polymer with 2 minutes of rapid mixing and 5 of flocculation provided for effective coagulation. Solids separation at an overflow rate of 1200 gpd/sq ft was accomplished in a standard circular clarifier. Readjustment of pH was necessary for precipitation of aluminum. Spent acids were neutralized on a batch basis with lime and caustic as efficient precipitation of heavy metals was accomplished. (Pfeifer-FIRL)
W77-10346

SODIUM BICARBONATE TREATS ACIDIC INDUSTRIAL WASTES,
South Carolina Univ., Columbia. Environmental Engineering Program.
K. Y. Chen, and N. R. Barber.
Industrial Wastes, Vol. 23, No. 3, p 30-31, May/June, 1977. 1 fig, 1 tab.

Descriptors: *Sodium compounds, *Bicarbonates, *Acidity, *Cost comparisons, *Industrial wastes, Metals, Sludge digestion, *Waste water treatment, Alkalinity.
Identifiers: Sodium bicarbonate, Buffering.

Because of its reserve buffering capacity, sodium bicarbonate is an excellent base for reducing acidity of industrial waste waters to acceptable levels. Unlike stronger bases, sodium bicarbonate can hold the pH within a range (6-9) required for precipitation of toxic metals and the flourishing of sludge digestion organisms. Its buffering capacity can eliminate the need for elaborate pH monitoring and chemical metering systems needed to deal with changes in pH from inflow of new acidic wastes or from the processes of treatment itself (e.g., chlorination and oxidation). This is a particularly important factor for industrial waste water treatment plants lacking the self-stabilizing mechanisms of municipal plants. Above the 4.3 pH level sodium bicarbonate, currently $160/ton, is as economical as any other base and capital costs of usage are much lower. The pH level of 100 ml of acidic industrial waste waters was raised to an acceptable level of 6.0 or above using 1.2 g sodium bicarbonate. For a plant with 0.1 MGD of acidic wastes, this amounts to a daily required dosage of 4545 kg or $800 of chemical, with no mechanical components except a dosing device and mixer required. (Pfeifer-FIRL)
W77-10347

METAL FINISHING PLANT WASTE WATER PURIFICN.--BY TREATMENT WITH COPPER SULPHATE AND SODIUM SULPHITE TO REMOVE CYANIDE AND COPPER IONS.
Soviet Patent SU-528-265. Issued September 2, 1976. Soviet Inventions Illustrated, Vol. Y, No. 15, p 3, May, 1977.

Descriptors: *Patents, *Metals, *Waste water treatment, Industrial wastes, Water purification, Chemical precipitation, *Copper sulfate, *Sulfates.
Identifiers: Sodium sulfite, *Cyanide, Copper ions.

A patent was issued for a process to remove cyanide and copper ions from waste waters by treatment with CuSO4 and Na2SO3. CuSO4 is added in an amount equivalent to the CN(-) concentration, while enough Na2SO3 is added to reduce Cu(2+) to Cu(+). Cu(CN)2 precipitates rapidly. Such treatment can be used in the treatment of metal manufacturing waste waters. (Pfeifer-FIRL)
W77-10348

SOME ASPECTS OF HIGH GRADIENT MAGNETIC SEPARATION,
International Research and Development Co., Newcastle-upon-Tyne (England).
A. D. Appleton, and P. P. Dobbing.
Filtration and Separation, Vol. 14, No. 3, p 238-240, May/June, 1977. 4 fig, 2 tab, 3 ref.

Descriptors: Magnetic studies, *Filtration, *Separation techniques, Industrial wastes, *Waste water treatment, Water treatment, Water purification.
Identifiers: *Magnetic separation(Wastes).

The development of the high gradient magnetic separator (HGMS) has opened up possibilities for the use of magnetic filtration in water treatment. Design of the HGMS device is relatively simple: a chamber with a filamentary ferromagnetic material--stainless steel wool--in a saturating magnetic field. A large surface area is thus provided and magnetic tractive forces can be produced sufficient to permit separations of very weakly paramagnetic particles with diameters on the order of 1 micron. With water treatment, solids to be removed are generally non-magnetic so that seeding (e.g. 1000 ppm Fe304) and addition to a flocculating agent are required. Even bacteria and dis-

solved viruses can be separated. Analyses are presented on requirements for HGMS devices for water treatment at 1.75 and 7.5 MGPD levels. Further study is needed on cost-effectiveness of the HGMS, including the possible use of superconducting magnets. (Pfeifer-FIRL)
W77-10349

USE OF A MODIFIED TENAX GC COLUMN PACKING FOR THE DIRECT GAS CHROMATOGRAPHIC ANALYSIS OF PHENOLS IN WATER AT THE PPM LEVEL,
Leeds Univ. (England). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 5A.
W77-10350

OPERATING EXPERIENCES ON PETROCHEMICALS WASTE WATER TREATMENT PLANT OF GUJARAT AROMATICS PROJECT AT JAWAHARNAGAR,
Indian Petrochemicals Corp. Ltd. Jawaharnagar (India).
P. R. Gharekhan, and M. K. Prabhudesai.
Journal of the Institution of Engineers (India), Vol. 57, Part EN 2, p 58-64, February, 1977. 4 fig, 5 tab.

Descriptors: *Activated sludge, *Aromatic compounds, *Model studies, *Oil wastes, *Sludge disposal, Effluents, Industrial wastes, Design standards, Hydraulic standards, Organic wastes, Sludge treatment, Biological treatment.
Identifiers: Jawaharnagar(India), Gujarat Aromatics Project.

An overview for design efficiency and production problems during two years of operation of a petrochemicals waste water treatment plant in Jawaharnagar, India has led to the conclusion that hydraulic control of sludge return rate is an effective and simple method. Initial findings on simulated wastes suggested that a two-stage biological system using an aerated lagoon and an oxidation ditch would provide sufficient treatment for waste water from the Gujarat Aromatics Project. Control of the operation included regular measurement of BOD, pH, COD, dissolved 02, return sludge, sludge wasting volume, suspended solids, nitrogen, phosphorus, and various other compounds. The major disadvantage in hydraulic control of sludge return rate is that some of the return sludge or aeration tank effluents may be wasted. Design criteria and operating suggestions are presented for activated sludge treatment plants were sludge flow rates and characteristics may vary. (Schulz-FIRL)
W77-10351

REFINERY OIL/WATER SEPARATION EQUIPMENT AND ITS APPLICATIONS,
W. M. Kirkup.
Filtration and Separation, Vol. 14, No. 3, p 259-266, May-June, 1977. 5 fig, 5 tab.

Descriptors: *Oil-water interfaces, *Oily water, *Oil pollution, Oil industry, *Separation techniques, Filtration, *Oil wastes, Effluents, Equipment, Organic wastes, Chemical wastes, Liquid wastes, Water purification, Industrial wastes, Design criteria, *Waste water treatment.

Petroleum refinery waste water systems are designed to handle various types of contaminated water, including: oil-free water, cooling water, process water, and sanitary and other waste water. Equipment and processes for the removal of oil from waste water are described here. Size and shaped criteria for the widely used gravity-type oil-water separator are presented. Operating data for parallel plate separators are examined. After primary separation, secondary separation or filtering is required. Secondary equipment described includes: sand filters, rapid sand filters, automatic backwash sand filters, rotary vacuum precoat filters, hay filters, and gravity differential separators. Dissolved air flotation may be used for removal of oil emulsions and suspended solids. An equalization basin is necessary to eliminate drastic changes in pH or temperature. Treatment of contaminated ballast water from oil tankers and barges is discussed. (Schulz-FIRL)
W77-10352

PREPARATION OF STAINED ALGINATE BEADS FOR PHOTOSENSITIZED OXIDATION OF ORGANIC POLLUTANTS,
Charles F. Kettering Research Lab., Yellow Springs, Ohio.
G. R. Seely, and R. L. Hart.
Environmental Science and Technology, Vol. 11, No. 6, p 623-625, June, 1977. 13 ref.

Descriptors: *Phenols, *Organic wastes, *Oxidation, *Chemical wastes, *Separation techniques, Ion exchange, Petroleum wastes, Industrial wastes, *Waste water treatment, Water purification, Organic compounds, Waste disposal.
Identifiers: Alginate, Photosensitized oxidation.

A method for the disposal of phenols and other toxic organic pollutants, including amines, olefins, and mercaptans, has been developed. In this process, gelled beads of the natural polysaccharide, alginic acid, are stained with photosensitizing cationic dyes. The stained beads are then capable of acting as a photochemical catalyst, oxidizing organic substrates in sunlight or artificial light. Alkaline conditions can be created within the beads by incorporation of slightly soluble basic minerals such as CaCO3, SrCO3, BaCO3, MgCO3, or dolomite when necessary to facilitate ionization or neutralization of acids formed during the oxidation of phenols. Incorporation of dye into the porous beads allow separation of the treated water from the beads by draining. Large-scale applications of this method of phenol detoxification using inustrial lagoons open to sunlight may be possible. (Schulz-FIRL)
W77-10353

INDUSTRIAL WASTE WATER PURIFICATION - USING BROWN COAL SEMICOKE AT ELEVATED TEMP. AS ADSORBENT FOR PHENOLIC AND OTHER ORGANIC IMPURITIES,
L. A. Kogan, I. B. Evzel'man, and V. M. Kagasov.
Soviet Patent SU-521-232. Issued September 10, 1976. Soviet Inventions Illustrated, Vol. Y, No. 18, p D15, June, 1977.

Descriptors: *Patents, *Absorption, *Phenols, *Coals, *Organic wastes, *Chemical wastes, *Waste water treatment, Water purification, Industrial wastes, Effluents, Liquid wastes.
Identifiers: Brown coal, Coke, Chlorophenol.

A patent for a process to remove organic compounds for aqueous effluents produced by coke-chemicals manufacturing has been issued. Adsorption at 60-90 C using brown-coal semicoke removes 90% of the phenol and 82% of the chlorophenol present in the aqueous effluent, compared with 10% and 24%, respectively, with conventional brown coal processing. (Schulz-FIRL)
W77-10354

EXPERIENCE WITH THE DESIGN AND OPERATION OF SMALL EXTENDED OPERATION AERATION WASTEWATER TREATMENT PLANTS,
Gutteridge, Haskins and Davey Pty Ltd., Melbourne (Australia).
J. A. Crockett, and R. M. Olliff.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p. 98-102. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Waste water treatment, *Treatment facilities, *Design criteria, *Aeration, Water treatment, Performance, Water quality standards, Aerobic treatment.

An analysis of operating results from a number of small extended aeration wastewater treatment plants leads to the conclusion that many such plants do not meet current more stringent statutory effluent quality requirements as nearly as they might. Experience with three plants is described in detail and then general reasons for unsatisfactory plant performance are presented. The main reasons are a need for some design improvements and a need for improving operating procedures. Standardization of the design of small plants is seen as the best means of providing small treatment plants at optimum cost. A checklist for use in the design of small plants is included. (CSIRO)
W77-10368

APPROACH TO LIQUID EFFLUENT CONTROL IN A NITROGENOUS FERTILIZER PLANT,
Consolidated Fertilizers Ltd., Newcastle (Australia).
For primary bibliographic entry see Field 5G.
W77-10370

BACTERIAL DENITRIFICATION - A REVIEW,
Melbourne Univ., Parkville (Australia). Dept. of Microbiology.
N. F. Millis.
Water (Journal of the Australian Water and Wastewater Association), Vol. 4, No. 1, p 15-18, March 1977. 7 fig, 1 tab, 12 ref.

Descriptors: *Denitrification, *Bacteria, *Nitrates, Waste water treatment, Sewage treatment, Nutrient removal, Anaerobic conditions, Biological treatment, *Reviews.

In treating waste water, the oxidation of organic nitrogen to nitrate is a desirable objective; however, if the treated water is to be reclaimed for drinking water or discharged into inland fresh waters, a high nitrate content is likely to be deleterious. One method of reducing nitrate content is to utilize bacteria with the ability to reduce nitrate to nitrogen or gaseous oxides of nitrogen. The necessary conditions for the encouragement of this process are: the presence of species with denitrifying ability; the presence of nitrate; anaerobic conditions; and the presence of a source of reducing power (usually a carbon compound). Provision of these conditions may be made either separately from the oxidative nitrification stage of treatment, or in the same reactor, using sludge or settled sewage to accomplish the reduction. Methods employing each strategy are reviewed. (CSIRO)
W77-10373

LET'S TALK RUBBISH; PART 2: RECYCLING SYMPOSIUM,
P. B. Publico.
Municipal Engineer, Vol. 7, No. 1, p 13-15, 1976.

Descriptors: *Recycling, Solid wastes, Waste disposal, Environmental pollution, Research and development, Wastes, Feeds, Separation techniques, Waste treatment.
Identifiers: South Africa, Sandton, Witwatersrand.

A short summary is presented of the lectures and discussions held at the symposium on 'Recycling of Waste Materials' at Sandton, South Africa, on 16 and 17 October 1975. The economic and ecologic aspects, separation techniques and practical problems were among the subjects discussed. (So African Water Info Center)
W77-10381

AN EVALUATION OF WATER REUSE FOR MUNICIPAL SUPPLY,
Southern Illinois Univ. at Carbondale.
D. Dworkin, and D. D. Baumann.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-005 053, Price codes: A08 in paper copy, A01 in microfiche. December 1974. Corps of Engineers IWR-Contract Report 74-11, 266 p, 31 fig, 33 tab, 4 append.

Descriptors: *Water reuse, *Colorado, *Water supply development, *Waste water treatment, *Water allocation(Policy), Water storage, Water, Water delivery, Water control, Water management(Applied), Water quality, Effluents, Prior appropriation, Social impact, Social adjustment.

Effective reuse of renovated water can be beneficial because it allows for mobilization, rather than waste of excess water supplies. Present water reuse practices in Colorado Springs were compared to simulated results of a model plan in an effort of determine which plan was most efficient. The results indicated that present reuse practices were inefficient because they provided reuse for many years when abundant water was available. Consequently, water reuse should be viewed as a management alternative to water supply planners and not as a parallel source of water supply. Furthermore, implementation of water reuse plans will be dependant upon social acceptability of using renovated water. Finally, the authors point out that states following the doctrine of prior appropriation might be reluctant to adopt an efficient reuse system because their present appropriation, based on need, might be decreased resulting in a loss of future rights to water. (Josepher-Florida).
W77-10444

DEMONSTRATION OF VOID SPACE STORAGE WITH TREATMENT AND FLOW REGULATION.
For primary bibliographic entry see Field 5F.
W77-10532

WASTEWATER MANAGEMENT PROGRAM, JAMAICA BAY, NEW YORK, VOLUME I: SUMMARY REPORT,
Ludwig (H. F.) and Associates Engineering-Science, Inc., Arcadia, Calif.
D. L. Feuerstein, and W. O. Maddaus.
1976. 182 p, 85 fig, 37 tab, 14 ref, 3 append. EPA Technical Report EPA-600/2-76-222a.

Descriptors: *Water treatment(Applied), *Water pollution control, *Water quality, *Combined sewers, *Treatment facilities, Overflows, Oxygen demand, Suspended solids, Organic matter, Aeration, Nutrients, Costs, Waste water treatment.
Identifiers: Jamaica Bay(NY), New York Bight.

A three-year study was conducted to develop management criteria and procedures for the Jamaica Bay, New York, ecosystem. Management of combined sewer overflow was important to water contact recreation in the bay. Four municipal treatment facilities discharged their organic and nutrient materials into the bay. Significant quantities of solids and coliforms resulted from combined sewer overflows. The treatment facilities were being upgraded for better removals of suspended solids and organic, oxygen-demanding materials. A construction plan was instituted to build treatment facilities for the eight major combined sewer overflows to reduce bacterial densities. Three facilities were upgraded to full step-aeration processes. An auxiliary plant was built to treat combined sewer overflows from two basins. Reduction of oxygen-demanding materials to near natural background levels could be accomplished by routing most of the dry- and wet-weather treated effluents and combined sewer overflows from the bay to the New York Bight. The planned upgrading program was expected to produce levels of these materials which would not be detrimental to the ecosystem. Cost-effectiveness studies were implemented to determine the most reasonable development of a waste water management program for the bay. (Collins-FIRL)
W77-10533

PHYSICAL - CHEMICAL TREATMENT PLANT DESIGN,
CH2M Hill, Reston, Va.
G. L. Culp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 957, Price codes: A03 in paper copy, A01 in microfiche. 1972. 33 p, 7 fig, 3 tab, 1 ref.

Descriptors: *Design criteria, *Efficiencies, *Treatment facilities, Chemical treatment, Physical properties, Coagulation, Filtration, Sedimentation, Dewatering, Flocculation, Flows, Adsorption, Carbon, Phosphorus, Suspended solids, Sludge treatment, Waste disposal, Economics, Evaluation, Organic matter, Separation techniques, Water purification, Waste water treatment.

Techniques for determining the efficiency of physical-chemical treatment processes for waste water, and the parameters of treatment plant design, were discussed. All processes utilize coagulation and sedimentation for the removal of suspended solids, and of phosphorus in some instances. Some processes also use filtration for such removal. Soluble organics are removed in all processes by the use of activated carbon. Pilot studies should be done when possible to aid in determining design parameters. Laboratory studies on representative water samples can generate suitable data. Tests were presented to aid in the selection of coagulants--polymers, lime, iron salts, or aluminum salts. Design criteria considered include: flow; chemical feed, rapid mix, and flocculation; clarifier sizing; recarbonation; filtration; granular carbon adsorption; and carbon regeneration. Other considerations include sludge dewaterability, disposal costs, and quantities. (Collins-FIRL)
W77-10534

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTE WATER TREATMENT,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
C. E. Pound, R. W. Crites, and R. G. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 448, Price codes: A04 in paper copy, A01 in microfiche. 1975. 25 p, 4 fig, 13 tab, 4 ref.

Descriptors: *Design criteria, *Cost comparisons, *Tertiary treatment, *Irrigation, *Infiltration, *Percolation, *Flow, Economies of scale, Variable costs, Cost analysis, Water conveyance, Land appraisals, Sites, Storage, Overland flow, Waste water treatment.
Identifiers: Land application systems, Advanced waste water treatment.

A cost-effective comparison was made of land application and advanced waste water treatment (AWT) systems. Important factors for comparison included: pretreatment, conveyance, storage, application, and local land assessment. The sensitivity of land application systems to design criteria variations was illustrated with cost curves. Several general conclusions were drawn from these curves. Land application systems presented less economy of scale than AWT systems. At low flow capacities land application systems could remain economically competitive, even with higher land costs, but were more sensitive to conveyance distance costs. Site conditions could create cost variations of 300 plus % for irrigation, overland flow, and infiltration-percolation systems. Irrigation cost variations were more extreme due to a greater number of cost component variables. The federal share is a higher percentage of total costs for land application systems than for AWT systems since for land application systems capital costs (75% federal) are higher and operating and maintenance costs (100% local) are lower. The data provided were for general comparisons of the two systems, and should not be used to determine costs of specific alternatives in the planning process. (Collins-FIRL)
W77-10535

ENVIRONMENTAL IMPACTS OF ADVANCED WASTEWATER TREATMENT AT ELY, MINNESOTA,
Corvallis Environmental Research Lab., Oreg.
H. Kibby, and D. J. Hernandez.
1976. 30 p, 1 fig, 17 tab, 19 ref. Technical Report EPA-600/3-76-092.

Descriptors: *Tertiary treatment, *Resources, *Pollutants, Pollutant identification, Water pollution, Air pollution, Soil contamination, Chemicals, Lime, Chlorine, Electricity, Fuels, Polymers, Chemical analysis, Waste water treatment.
Identifiers: Resource utilization, Pollutant generation.

Resource utilization and pollutant generation were assessed at an AWT facility in Ely, Minnesota. The plant used a conventional secondary treatment system followed by tertiary treatment. The latter treatment consisted of two solids-contact clarifiers, a flow-splitter box, and dual media filtration for phosphorus removal. Backwash water was returned to the secondary plant influent line. Filter effluent was either chlorinated and discharged, or recycled as process water. Annual direct use sources were: lime (538 tons), CO2 (168 tons), chlorine (5.2 tons), electricity (780,000 kwh), fuel oil (63,000 gallons), FeCl3 (44 tons), sulfuric acid (82 tons), and polymers (670 pounds). Data were also provided on the production of these resources. Resultant pollutants were grouped as discharges to air, land, or water. The collected data indicated resources needed and pollutants to be expected at any similar facility. (Collins-FIRL)
W77-10536

EVALUATION AND UPGRADING OF A MULTI-STAGE TRICKLING FILTER FACILITY,
AWARE, Inc., Nashville, Tenn.
J. H. Koon, R. F. Curran, C. E. Adams, Jr., and W. W. Eckenfelder, Jr.
1976. 138 p, 56 fig, 21 tab, 21 ref. EPA Technical Report EPA-600/2-76-195.

Descriptors: *Trickling filters, *Biological treatment, *Adsorption, *Activated sludge, *Activated carbon, *Biological oxygen demand, Microorganisms, Organic compounds, Recycling, Industrial wastes, Monitoring, Oxygen, Separation techniques, Waste water treatment.
Identifiers: Air stripping, Organic chemical industry.

Treatment of wastes from a multiproduct organic chemical plant by trickling filter was investigated. The trickling filter was a full-scale, six-stage operation. Pretreatment processes included solvent separation, flow measurement, neutralization, equalization, and nutrient addition. The trickling filter system consisted of six 20-feet deep filters which operated in series. This was followed by a final clarification. Tests indicated that serial operation did not cause microorganisms acclimation or enhance BOD removals. Air stripping and biological mechanisms significantly contributed to total BOD reduction. Filter performance was greatly improved by effluent recycle. A 90% BOD reduction, at a hydraulic loading of 2 gpm/square foot, required a 600% recycle. Bench scale activated sludge investigations supported the use of this process for system improvement. Determinations were made of kinetic parameters necessary for the design of activated sludge systems. Results

of air and oxygen aeration studies suggested that treatment of wastes with volatile substances would be difficult in a closed oxygen system. Activated carbon adsorption, following activated sludge treatment, was very effective in upgrading performance. Adsorption could remove some refractory organics and color-producing substances. A significant nonadsorbable organic fraction remained. (Collins-FIRL)
W77-10537

RENOVATED WASTEWATER AS A SUPPLEMENTARY SOURCE FOR MUNICIPAL WATER SUPPLY: AN ECONOMIC EVALUATION,
Municipal Environmental Research Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 3C.
W77-10540

INSPECTION AND REPAIR OF MAIN-SEWERS (L'INSPECTION ET LA REPARATION DES COLLECTEURS D'EGOUTS),
J. Sion.
Techniques et Sciences Municipales - L'Eau, Vol. 67, No. 11, p 441-444, November, 1972. 6 fig.

Descriptors: *Sewers, *Inspection, *Repairing, Pipes, Flow rates.
Identifiers: France, Closed-circuit television.

The use of closed-circuit television is being considered in France for the inspection and repair especially of old sewers. Old sewer pipes are rigid making them susceptible to breakage and joint defects and roots cause partial obstruction of the flow cross-section. Flow obstacles result in low flow rates and in increased concrete corrosion hazards due to the formation, from hydrogen sulfide, of sulfuric acid. These problems can be detected and localized in inaccessible sewer pipes through the use of closed-circuit television when the camera is pulled along inside sections between inlets. (Sandoski-FIRL)
W77-10541

TREATMENT OF COMBINED SEWER OVERFLOWS,
Rexnord, Inc., Milwaukee, Wis.
D. G. Mason.
Journal Water Pollution Control Federation, Vol 44, No 12, p 2239-2244, December, 1972. 3 fig, 6 tab, 6 ref.

Descriptors: *Combined sewers, *Overflow, Waste water treatment, Storm water, Effluent, Polyelectrolytes, Disinfection, Chlorine, Capital costs, Operating costs.
Identifiers: *Dissolved air flotation, Ferric chloride, Chemical treatment.

A screening/dissolved air flotation system is shown as an effective method of reducing pollution caused by combined sewer overlows. Operation data over a two-year period of time indicate the following results. Effluent quality generally comparable to secondary effluent was obtained from the operation of a 5 mgd pilot unit. Ferric chloride (20 mg/liter) and a cationic polyelectrolyte (4 mg/liter) provided effective chemical treatment. The screening flotation system provided sufficient detention time for adequate disinfection with chlorine. Capital costs for a 90 mgd facility were estimated at $21,000/mgd of capacity. Operating costs were estimated at $0.0309/thousand gallons or $0.0082/thousand liters. (Sandoski-FIRL)
W77-10542

COMBINED SEWER OVERFLOWS,
Municipal Environmental Research Lab., Edison, N. J. Storm and Combined Sewer Section.
Civil Engineering, ASCE, Vol 43, No 2, p 57-60, February, 1973. 1 fig.

Descriptors: *Combined sewers, *Overflow, Financing, Water pollution control, Cities, Population, Costs, Research and development, Plastics, Flow rates, Sewage, Computers, Pipes, Construction materials, Monitoring, Polymers.
Identifiers: Pollution control research.

To date 116 grants and contracts totaling about 82 million dollars have been awarded in storm and combined sewer pollution control research, development, and demonstration by federal agencies. More than 1300 municipalities with a population of 54 million are served by 55,000 miles of combined sewers with untreated storm-generated combined sewer overflows occurring 3 to 6 percent of the time annually. The need for capital spending to storm and/or treat combined sewer overflows can be relieved by reducing or attenuating flow to be treated and/or increasing the effective flow capacity of existing facilites. Some recent EPA-supported projects include: heat shrinkable plastic tubing made of polyolefin-polymeric base hot melt adhesive used in coupling durable, wateright, joints to conventional sewer pipes; anti-corrosion coatings of vinyl-vinylidene chloride, vinyl acetate-acrylic, nitrile rubber latex, and various rubbers which may reduce costs by 90 percent over epoxy and plastic liners; refinement of the swirl flow regulator/solids-liquid separator to function efficiently over a wide range of combined sewer overflow rates; a network for remote monitoring of rainfall, flow levels, and quality at selected locations together with a centrally computerized control console for positive regulation of the overflow structures through utilization of storage capacities within the existing sewers to reduce the frequency and volume of overflows; and, certain polymers added to increase the rate of flow of sewage thus increasing the sewer capacity. (Sandoski-FIRL)
W77-10543

NEW INTERCEPTOR SEWER IS A 'PRIME TIME' PROJECT,
Burns and McDonnell, Kansas City, Mo.
N. Kuehl, and R. Lucas.
Public Works, Vol. 104, No. 3, p 71, March, 1973. 1 fig.

Descriptors: *Waste water treatment, *Interceptor sewers, *Treatment facilities, Missouri, Missouri River, Construction, Sewers, Concrete, Flow.

A $100 million Little Blue Valley interceptor and waste water treatment facility will service 225 square miles draining the eastern slopes of Independence, portions of Kansas City, six other towns, and two federal installations in Missouri. With construction already underway on a 9-foot, 7-inch concrete arch sewer, pump station, and interim treatment plant, improved waste water treatment will be available by 1974 to a major portion of Independence. The projected date of completion for the interceptor and treatment facilities in 1980. The interceptor system ranges in size from 132 inches, or the hydraulic equivalent, at the downstream end to small collectors at the farthest point upstream. Peak flow capacity at the downstream location will be 315.8 mgd with future increase possible through construction of peak-flow pumping stations. Eventually, all wastewater generated in the watershed will flow to a plant located near the Missouri River. (Sandoski-FIRL)
W77-10546

SEWERS UNDER ATTACK: THE HYDROGEN SULPHIDE PROBLEM,
J. Pullin.
Surveyor, Vol. 149, No. 4433, p 12, May 27, 1977.

Descriptors: *Hydrogen sulfide, *Sulfur compounds, *Pipes, *Anaerobic conditions, *Corrosion, Corrosion control, Chemical degradation, Sewers, Pipe flow, Waste water treatment.

Hydrogen sulfide can be produced in sewage under anaerobic conditions by the reduction of sulfate, or in sewers containing dissolved oxygen but having a layer of biological slime coating the sewer pipe wall. The hydrogen can be then oxidized in the presence of Thiobacillus concretivorus to sulfuric acid which can cause considerable damage to sewer pipes. Factors influencing the rate of H2S build-up include oxygen concentration, temperature, and concentrations of sulfate and organic matter in the sewage. Increased temperatures and decreased oxygen concentrations increase sulfide production. The resistance of various pipe materials to attack by sulfuric acid is examined. Although vitrified clay pipes are resistant to corrosion, cast iron, steel, and concrete pipes will deteriorate unless other preventive measures are taken. Use of plastic liners for sewer pipes, periodic treatment with caustic soda or lime, and application of chlorine are suggested as methods for reducing corrosion. (Schulz-FIRL)
W77-10548

WASTEWATER COLLECTION,
Nottingham (H. D.) and Associates, Inc., McLean, Va.
T. Singh, and J. S. Bhutani.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1074-1078, June, 1977. 55 ref.

Descriptors: *Combined sewers, *Infiltration, *Inflow, *Plastics, *Maintenance, Storm drains, Sewerage, Sanitary engineering, Municipal wastes, Urban runoff, Storm runoff, Maintenance costs, Waste water treatment, Rehabilitation, Replacement costs, Construction, Construction materials, New York.
Identifiers: Tampa(FL), Grand Rapids(MI), Bossier City(LA), Montclair(NJ).

Various methods developed during 1976 for the collection of waste water are reviewed. An evaluation of general sewage problems and future waste water treatment needs for New York City is given. Design criteria are described for the construction of storm retention basins, combined sewer systems, and other waste water collection and storage systems. The use of plastic pipes for highly corrosive and abrasive waste water flows is evaluated. Inspection, monitoring, and maintenance are considered for the safer, more efficient operation of waste water systems. Recent monitoring techniques for characterizing infiltration/inflow in a continuing program of sewer maintenance are evaluated. Experiences of various municipalities in the use of polyethylene pipe insertion for the correction and prevention of infiltration/inflow problems by sewer rehabilitation or new construction are related. Maintenance techniques and applications presented include television monitoring of newly installed sewer lines, chemical treatment retard the growth of tree roots in sewers, and standardization of inflow/infiltration measurements using hydrographic analysis. A design for a waste water lift pump designed to handle large flows is described. Sewer system rehabilitation and maintenance is mentioned as a cost-effective method of increasing treatment plant capacity. (Schulz-FIRL)
W77-10549

TREATMENT OF EFFLUENTS: MODERN METHODS OF SEWAGE DISPOSAL,
University Coll. of Swansea (Wales). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5E.
W77-10550

TRACE ELEMENTS IN WASTEWATER,
California Univ., Riverside. Dept. of Agricultural Engineering.
A. C. Chang, and A. L. Page.
California Agriculture, Vol 31, No 5, p 32-33, May, 1977. 4 tab.

Descriptors: *Trace elements, *Metals, *Water reuse, Phytotoxicity, Effluents, Waste disposal, Sludge disposal, Fertilizers, Industrial wastes, Food chains, Waste water treatment.

A study was done on the effects of trace element concentrations on the reuse of waste water effluents and sewage sludge for agricultural and municipal purposes. Elements studied included B, Cd, Cr, Cu, Pb, Hg, Ni, and Zn. Most waste effluents could meet criteria for trace element concentrations established by the National Academy of Science and National Academy of Engineering Joint Committee in 1972. Because the actual concentrations of trace elements may vary considerably with the nature of the community, its related industries, and its treatment system, direct reuse of waste water for public water supply is not recommended by regulatory agencies at the present time. Agricultural use of sludge with nominal trace element concentrations is not generally detrimental to plants, but it does present a potential danger to human consumers if accumulation in edible plant tissues is significant. Proper selection of crop species, soil type, and sludge composition may minimize accumulation of trace elements in plant tissue. Use of sludge that is unusually high in trace element concentrations is discouraged. (Schulz-FIRL)
W77-10577

$885 MILLION-PLUS PLAN IS RECOMMENDED FOR BOSTON AREA,
Massachusetts Metropolitan District Commission, Boston.
M. Weiss, and J. P. Vittands.
Water and Wastes Engineering, Vol 14, No 6, p 30-34, June, 1977. 2 fig, 1 tab.

Descriptors: *Sludge disposal, *Sludge treatment, *Municipal wastes, *Regional development, *Comprehensive planning, Overflow, Feasibility studies, Waste water treatment, Waste water disposal.
Identifiers: Boston(MA).

A study was done on possibilities for improving municipal waste water treatment capacity for the Boston Metropolitan Sewerage District. Five concepts for waste water management were considered, including various degrees of expansion of service, decentralization, and waste water disposal through land application. Capital costs for the various concepts, with the exception of land application, were approximately equal. After evaluation of the five plans presented, moderate decentralization was recommended. The recommended plan includes upgrading existing facilities and constructing two new AWT satellite plants. Costs will be apportioned among member municipalities. (Schulz-FIRL)
W77-10578

MARYLAND RESEARCH FINDING GUIDELINES FOR SLUDGE USE.
For primary bibliographic entry see Field 5E.
W77-10580

THE PERSISTENCE OF POLIOVIRUS IN ACTIVATED SLUDGE TREATMENT,
Surrey Univ., Guildford (England).
S. A. Balluz, H. H. Jones, and M. Butler.
Journal of Hygiene, Cambridge, Vol. 78, No. 2, p 165-173, 1977. 4 fig, 1 tab, 15 ref.

Descriptors: *Viruses, *Persistence, *Activated sludge, Temperature, Suspended solids, Operations, Performance, Separation, Model studies, Treatment facilities, Waste water treatment.

Poliovirus persistence during activated sludge treatment was studied in a model activated sludge treatment facility. Poliovirus was inoculated either continuously or by single dose. Viral distribution in influent, mixed liquor, and effluent was regularly monitored. Observations of viral decline during sewage treatment were confirmed. It was concluded that virus removal efficiencies were related to suspended solids content would likely contain low viral counts. Careless disposal of untreated sludge may be the cause of pathogenic virus transmission in sewage whose effluent was apparently virus-free. It was not possible to determine reasons for differences in viral decline rates after cessation of inoculation of the two experimental systems. It was suspected that a relationship existed with solids loading. The viral inactivation mechanism was not understood, although direct or indirect biological activity was considered the most important factor. (Collins-FIRL)
W77-10583

A MODEL FOR ALUMINUM PHOSPHATE PRECIPITATION,
Washington Univ., Seattle. Dept. of Civil Engineering.
J. F. Ferguson, and T. King.
Journal Water Pollution Control Federal, Vol. 49, No. 4, p 646-568, April 1977. 11 fig, 1 tab, 20 ref, 1 append.

Descriptors: *Model studies, *Separation techniques, Phosphate, Aluminum, Hydrogen ion concentration, Sewage effluents, Physical properties, Chemical properties, Design criteria, Waste water treatment.

A conceptual and numerical model for orthophosphate precipitation was described. The model accounted for many experimental and field studies on aluminum addition. The process was modeled as an equilibrium precipitation process. Phosphate removal was approximately stoichiometric at an Al:P mole ratio of 1.4 until a residual of nearly 1 mg/liter at a final pH of 5.2-6.9. Aluminum and phosphate mass balances could be used to compute residuals from aluminum phosphate solubility at doses near the stoichiometric requirement. Overdosing above 60 mg/liter only changes the final pH. Intense initial mixing and uniform chemical addition are necessary for efficient use of alum in the stoichiometric zone. Phosphate reduction usually causes a reduction in chemical costs if done in the stoichiometric zone, except when alkalinity is high or low. Qualitative reproductions of the effects of alum dosage and pH seen in experimental studies can help estimation of the potential applicability of alum for a particular waste water and the needed chemical dosages. (Collins-FIRL)
W77-10584

WATER HYACINTH CULTURE FOR WASTEWATER TREATMENT,
Texas Dept. of Health Resources, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
1976. 143 p, 30 fig, 60 tab, 32 ref, 1 append.

Descriptors: *Water hyacinth, *Aquatic plants, *Stabilization, *Waste water treatment, *Water quality, Heavy metals, Biochemical oxygen demand, Soil-water-plant relationships, Plant physiology, Biological treatment, Waste treatment.
Identifiers: *Eichornia crassipes.

Water hyacinths, Eichornia crassipes, have been considered as a means of improving effluent quality. In a study conducted in Austin, Texas, stabilization pond effluent was passed through shallow earthen basins which were covered with water hyacinths. Water hyacinths were effective in removing algae, other suspended particles, and dissolved impurities from the effluent. They also reduced nitrogen, fecal coliform bacteria, BOD5, COD, and suspended solids in the stabilization ponds. Various heavy metals and other elements accumulate in plant tissue, including: Cl, P, As, Fe, Cu, Cr, Hg, Pb, Ni, Zn, Mg, Mn, and K. A one acre crop of mature plants was estimated to contain more than 2,500 pounds of minerals. Cultivation of hyacinths can be used to purify waste waters in climatically favorable zones, while sources of heat for hyacinth beds during colder winter periods might include use of raw sewage, incineration of garbage, anaerobic digester gas, cooling waters of power stations, and solar panels. (Schulz-FIRL)
W77-10586

SUBMERSIBLE PUMPS SPEED SEWAGE FLOW,
J. E. Ransom.
The American City and County, Vol. 92, No. 6, p 70, June, 1977.

Descriptors: *Pumping plants, *Pumps, Equipment, Sewers, Treatment facilities, Sewage effluents, Regulation, Planning, Cities, Urban areas, Performance, Maintenance, Inspection, Waste water treatment.
Identifiers: Florence(KY).

Rapid community and area growth and overloaded pumping stations created sewage handling problems in Florence, Kentucky. A modified activated sludge process package plant was constructed to support the original facility. In the mid-1960s, the three original pumping stations suffered from frequent breakdowns and flooding. These were converted to electrical submersible pumps, which were also used in the nine stations subsequently constructed. Station capacity can be increased by changing impellers or adding another pump. Equipment failure due to flooding has been eliminated because the pumps operated submerged normally. No major problems have since occurred, and maintenance and inspection have been simplified. City regulation of pumping station construction has standardized equipment and contributed to the simplification of inspection and maintenance. (Collins-FIRL)
W77-10587

EXTENSIVE COLLECTION SYSTEM HIGHLIGHTS $30 MILLION POLLUTION CONTROL PROGRAM.
Water and Wastes Engineering, Vol. 14, No. 5, p 35-38, May, 1977.

Descriptors: *Waste water treatment, *Municipal wastes, Sewers, Sewage systems, Industrial wastes, Interceptor sewers, Planning, Design, Costs.
Identifiers: Haverhill(MA), Merrimack River.

A $30-million waste water collection and treatment project is nearing completion in Haverhill, Massachusetts. The project selected, one developed by Camp Dresser and McKee, follows an intermediate plan and will be able to handle treatment of all dry weather waste water flows. Excess flows during rainfall and snowmelt will be diverted to the Merrimack River. Other collection approaches--separation of storm water and waste water or treatment of all collected water--were rejected as too costly and disruptive. The 18 mgd capacity of the activated sludge facility will meet the needs of the city's estimated 1985 population (48,500) and also those of nearby Groveland. The plant is designed to treat wastes of paper, tannery, and textile manufacturing as well. Construction has also included two major intercepting sewers on either side of the dividing river, and three inverted river crossings conveying waste water to the south bank where a 30 mgd peak capacity pumping station is being built. Treatment processes will include screening, primary sedimentation, aeration, final sedimentation, and chlorination. (Pfeifer-FIRL)
W77-10588

EPA INDEXES SHOW COSTS RISING AT QUICKER PACE.
Engineering News Record, Vol. 198, No. 25, p 120, June, 1977. 1 tab.

Descriptors: *Cost analysis, *Cost comparisons, *Construction costs, *Sewage treatment, *Waste water treatment, Sewers, Cost trends, Water costs.

Compilations made by the Environmental Protection Agency (EPA) on municipal waste water treatment plants and urban sewer system construction costs have shown that costs have risen from about 1% to over 2% during the first part of 1977. Sewer construction costs were 105% higher during the first quarter of 1977 than during the five-month total for 1976, with the rate of increase for the complete urban sewer system being the greatest. Comparisons of sewage treatment plant and sewer construction cost indexes for 5 mgd municipal waste water treatment facilities in 25 cities, 50 . mgd treatment facilities in 25 cities, and complete urban sewer systems are presented. (Schulz-FIRL)
W77-10589

GROUT ROUTS SEWER PROBLEMS,
Metropolitan Sewer District, St. Louis, Mo.
C. G. Sweeney.
Water and Wastes Engineering, Vol. 14, No. 5, p 59-60, May, 1977.

Descriptors: *Municipal wastes, *Grouting, *Pipes, *Repairing, *Maintenance, Municipal wastes, Waste water treatment, Sewers, Sewer systems, Costs.
Identifiers: Television inspection, St. Louis(MO).

The St. Louis Metropolitan Sewer District, established in 1954, was an early experimenter with TV inspection and grouting for sewer line maintenance. The district, a consolidation of 90 municipalities, towns, and unincorporated areas, continues to show great success in the use of these techniques. The district requires efficient use of funds, equipment, and manpower for upkeep of its complex system. Two TV inspection/grouting units are now on daily operation. While they are a direct and effective approach for handling emergenices, they are largely deployed for preventive maintenance. Areas of heavy infiltration/inflow are identified for inspection by the units. Sources of inflow are pinpointed by TV inspection and dye testing. A 'pump until no acceptance' formula is used, restricting t 5 or 6 gallons the maximum amount of grout--a viscous acrylamide gel--that is generally required. Costs of chemical grouting are estimated to be 1% that of repair by other methods. Inspections carried out six months after every grouting have never revealed any evidence of breakdown or deterioration. (Pfeifer-FIRL)
W77-10590

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
D. G. M. Roberts, and P. A. Banks.
Proceedings of the Institution of Civil Engineers, Part 1, Vol. 62, p 209-219, May, 1977. 3 tab, 5 ref.

Descriptors: *Sewers, *Design criteria, *Environment, *Corrosion control, *Linings, Pipes, Corrosion, Pumps, Conveyance structures, Treatment facilities, Waste disposal, Precipitation(Atmospheric), Water reuse, Waste water treatment.
Identifiers: Middle East.

Local influences on the design and operation of Middle Eastern sewer systems were examined. Waste treatment and water reuse were also discussed. Major problems result from high temperature, low rainfall, and the predominantly sandy ground surface. The temperature in sewers can reach 35 C which quickly produces septicity, especially in rising mains. The resultant H2S can cause severe corrosion. Design features which may ease the problems were: good gradients, small capacity pumps, restricted sump sizes, and short rising mains. Highly technological solutions were avoided. Linings and coatings which have been used successfully include coal tar epoxy, pure epoxy resins, and glass reinforced plastic. The use of expensive, non-corrosive pipes was frequently justified. Provisions should be made for heavy rainfall as most areas do not have storm sewers. Ingress of groundwater into house connections should be avoided to prevent sewer system overloading. The effectiveness of various treatment systems was evaluated and recommendations made as to their applicability. Careful handling and treatment were suggested for water reuse schemes. Use as industrial process water or orchard and agricultural irrigation water was recommended to prevent public health problems. Waste disposal and the economics of sewer systems and treatment facilities were briefly reviewed. (Collins-FIRL)
W77-10591

PVC SEWER PIPE SURVIVES DEEP BURIAL.
For primary bibliographic entry see Field 8G.
W77-10592

A NOTE ON SEWER DESIGN,
Roorkee Univ., India. Dept. of Civil Engineering.
P. K. Swamee, and N. S. Grewal.
Indian Journal of Environmental Health, Vol 19, No 1, p 69-72, January, 1977. 1 fig, 2 ref.

Descriptors: *Sewers, *Design criteria, Hydraulic design, Conveyance structures, Structural design, Flow, Mathematical studies, Equations, Conduits, Waste water treatment.

A method has been devised for the design of circular sewers to handle partially full flow conditions. Determinations are made for design parameters without any trial and error procedure. Parameters of known value, such as discharge, bed slope, and Manning's roughness coefficient n, are used to determine sewer radius, average flow velocity, and flow depth. Equations and a sample solution are provided to illustrate the process. (Collins-FIRL)
W77-10599

BIOLOGICAL REGENERATION OF POWERED ACTIVATED CARBON ADDED TO ACTIVATED SLUDGE UNITS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
F. B. DeWalle, and E. S. K. Chian.
Water Research, Vol. 11, No. 5, p 439-446, 1977. 9 fig, 2 tab, 33 ref.

Descriptors: *Activated carbon, *Activated sludge, *Model studies, Separation techniques, Organic matter, Bacteria, Adsorption, Biological treatment, Physical properties, Equations, Chemical oxygen demand, Sludge treatment, Waste water treatment.
Identifiers: Powdered activated carbon(PAC), Freundlich equation.

The effect of powdered activated carbon (PAC) on adsorption and biological regeneration in activated sludge units was investigated. PAC equilibrium concentrations of 0, 15, 300, and 1,000 mg/liter were introduced into plug-flow activated sludge units with sludge ages of 3, 5, 10, and 15 days. Average COD removals were independent of sludge age. A mathematical model was developed for the prediction of organic matter concentration reductions resulting from PAC addition. The Freundlich equation was used to describe the adsorptive behavior. The daily regenerated capacity as affected by the ratio of biological solids to activated carbon was also included. An apparent increase of maximum adsorptive capacity was observed with increased cell residence time in the units. The removal of slowly degradable organics could be caused by biological processes. This would free or regenerate some adsorption sites and increase PAC apparent adsorptive capacity. An important parameter could be the relationship of activated sludge concentrations to activated carbon concentrations. A higher relative magnitude of biomass produced easier PAC regeneration. It was concluded that the relative ratio of biological solids to carbon solids would determine the magnitude of daily regeneration. Daily regeneration increased approximately with the square root of the influent concentration. Further research was begun to confirm the model. (Collins-FIRL)
W77-10601

PHOSPHATE REMOVAL STUDIES AT BARRIE WATER POLLUTION CONTROL CENTRE,
J. Seldon.
Water and Pollution Control, Vol. 115, No. 5, p 30-32, May, 1977. 4 fig, 2 tab.

Descriptors: *Phosphates, *Chemical treatment, *Sulfates, Separation techniques, Treatment facilities, Effluents, Waste water treatment, Costs.
Identifiers: Aluminum sulfate, Barrie Water Pollution Control Center(Ontario Canada).

A study of phosphate removal was conducted at Barrie Water Pollution control Centre, Ontario, Canada. Required removal was 80% of the total incoming phosphate, but the plant's goal was an environmentally more beneficial level of less than 1 mg/liter final effluent phosphate. The plant was adding approximately 115 mg/liter of aluminum sulfate at eh discharge of the aeration tanks at the beginning of the study. The dosage was reduced to approximately 50 mg/liter over a 12-month period. Final effluent phosphate levels were found to increase in direct proportion to the decrease in aluminum sulfate dosage. Under normal conditions, the addition of 55 mh/liter of aluminum slfate consistently produced a total phosphate level of less than 1 mg/liter in the final effluent. This dosage appeared to be the minimum for acceptable phosphate removal. Reducing the dosage fom 115 to 55 mg/liter resulted in a $40,000 annual saving in chemical costs. (Collins-FIRL)
W77-10602

BRAZIL--A MARKET FOR BRITISH EFFLUENT AND WATER TREATMENT PLANT MANUFACTURERS,
R. M. Bradley.
Effluent and Water Treatment Journal, Vol. 17, No. 4, p 169-174, April, 1977. 2 fig, 3 tab, 9 ref.

Descriptors: *Water pollution, *Regional development, *Sewage treatment, Sewers, Industrial wastes, Waste water treatment, Cities, Public health, Regional economics, Oxidation lagoons, Outfall sewers, Sanitary engineering, Municipal wastes.
Identifiers: National Sanitation Plan(Brazil).

The water treatment problem in Brazil is discussed. Brazil is one of the largest, fastest-developing, and resource-richest nations in the world. Rapid population growth, heavy industrialization, and urbanization have caused increased water pollution problems. Sanitation facilities have not kept pace with population, and industrial treatment facilities are inadequate. Even sewage which is collected is often disposed of in its raw state. Recently steps have been taken to balance industrial needs against health and environmental concerns. Through the 1971 National Sanitation Plan (PLANASA), instituted to finance public health engineering works, piped water connections have increased 38%. Simple treatments such as stabilization lagoons and long sea outfalls are stressed. Efforts to spur the economy have resulted in restrictions which favor the development of local manufacturing plants for water treatment equipment.
W77-10603

STERILIZATION OF PURIFICATION PLANT SLUDGE BY MEANS OF ELECTRON RADIATION (HYGIENISIERUNG VON KLAERSCHLAMM DURCH ELEKTRONENBESTRAHLUNG),
K. Tofaute.
Brown Boveri Mitteilungen, Vol 64, No 3, p 164-170, 1977. 11 ref.

Descriptors: *Irradiation, *Sludge treatment, *Microorganisms, Equipment, Performance, Design criteria, Fertilizers, Waste treatment, Energy, Costs, Waste water treatment.

A process for the electron radiation sterilization of purification plant sludge, with subsequent use as agricultural fertilizer, is described. A minimum dose of 300 krad was adequate to rid the sludge of microorganisms. The size of the electron accelerator, with indicators: accelerator voltage in kV or mV, beam current in mA, and beam efficiency as the product of the former and the latter in kW, depended on various operational parameters. Accelerator voltage (kV or mV) determined measurement for depth of beam penetration in mm and therefore magnitude for the thickness of the sludge layer to be formed. Beam efficiency (kW) was converted into energy dose performance (mrad x kg/hr) as magnitude for quantity of processed sludge at a certain dose involving beam efficiency utilization. Energy dose performance in mrad x kg/hr could be calculated from the beam efficiency based on the formula: 1 kW = 360 mrad x kg/hr. The power dose performance transmitted to the purified sludge was determined by the beam efficiency level for the latter, set at 35-45%. The operation was subdivided into pre-treatment, radiation, storage, and discharge of sludge. Radiation screening for a 750 kV accelerator was considered sufficient when walls and ceiling were constructed of standard concrete, 1.10 m in thickness. No radiation protection for personnel was required. Depending on size of installation, treated sludge cost 1.0-1.5 Swiss Francs/cu m including power, which ranged from 0.4-0.6 SF/cu m depending on energy cost. (Takacs-FIRL)
W77-10604

HYGIENIC EFFECTIVENESS OF DISINFECTION OF SEWAGE AFTER ITS MECHANICAL TREATMENT (GIGIENICHESKAIA EFFEKTIVNOST' OBEZZARAZHIVANIIA BYTOVYKH STOCHNYKH VOD, PROSHEDSHIKH MEKANICHESKUIU OCHISTKU),
S. N. Cherkinskii, A. V. Kulikov, and G. P. Iakovleva.
Gigiena i Sanitariia, No. 3, p 18-22, March, 1977. 3 ref.

Descriptors: *Disinfection, *Pathogenic bacteria, *Chlorination, Sewage treatment, Coliforms, Bacteria, Microorganisms, Public health, Performance, Evaluation, Waste water treatment.

The effectiveness of disinfection of mechanically treated sewage by chlorination as required under epidemic conditions was studied. Counts of Escherichia coli and Salmonella paratyphi B were correlated with residual chlorine content after chlorination of sewage artificially infected with S. paratyphi B. This pathogenic germ was no longer detectable when the residual coli index was 3,000 or less and the residual chlorine content was at least 4.5 mg/liter. These values can be used as criteria for the routine check-up of the effectiveness of disinfection of sewage by chlorination. Disinfection can be considered effective and safe if the coli index does not exceed 3,000 at a minimal residual chlorine level of 4.5 mg/liter. (Takacs-FIRL)
W77-10605

WASTEWATER PHOSPHORUS REMOVAL USING LAND APPLICATION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
C. G. Enfield.
Civil Engineering-ASCE, Vol 47, No 6, p 58-60, June, 1977. 4 fig.

Descriptors: *Phosphorus, *Design criteria, *Sorption, Chemical properties, Soils, Performance, Analytical techniques, Temperature, Chemical reactions, Waste water treatment.

A graphical approach for determining phosphorus removal, as a design parameter of a soil waste water treatment system, was presented. This approach was based on phosphorus concentrations of a given waste water. System failure could be caused by exceeding the soil phosphorus sorption capacity. Investigations have shown that finer textured soils have a greater capacity for phosphorus sorption. The recommended procedure involved a laboratory study of each major soil series on the proposed site. Forty duplicated analyses of each sample were made to determine phosphorus sorption capacity. During equilibrium time, samples should be agitated and maintained at a constant temperature. This temperature should be the mean annual temperature of the site since reactions are temperature-dependent. The resultant sorption isotherm data should be extrapolated to estimate results of additional equilibrating time. (Collins-FIRL)
W77-10606

SODIUM BICARBONATE PROVIDES PH RELIEF FOR DIGESTER.
Water and Wastes Engineering, Vol 14, No 5, p 57, May, 1977.

Descriptors: *Anaerobic digestion, *Hydrogen ion concentration, *Alkalinity, Treatment facilities, Methane, Fuels, Gases, Performance, Equipment, Waste water treatment.
Identifiers: Sodium bicarbonate, Chatham Township(NJ).

Sodium bicarbonate was used to solve several digester problems in Chatham Township, New Jersey. The major problems were pH and alkalinity. The addition of sodium bicarbonate raised these indicators to a neutral range, and maintained those levels. A 5-6 foot scum blanket and 6-9 foot grit accumulation had been cleaned out of the plant's only anaerobic digester. Soon after, a drop in methane production indicated the beginning of a souring problem. A two-month treatment of 200-400 pounds/day of sodium bicarbonate increased the pH from 5.6 to 6.5 at the end of the first month. The pH finally stabilized at 7.1. Alkalinity rose to 3900 mg/liter and methane gas production rose as high as 8,000 cubic feet/day. The high level of methane produced which could be used as fuel resulted in reduced fuel costs. (Collins-FIRL)
W77-10607

OXYGENATION OF AQUEOUS WASTES: THE PROST SYSTEM,
Polytechnic Inst. of New York, Brooklyn. Dept. of Chemical Engineering.
D. F. Othmer.
Chemical Engineering, Vol 84, No 13, p 117-120, June, 1977. 2 fig, 8 ref.

Descriptors: *Oxygenation, *Waste treatment, *Oxygen, *Aqueous solutions, *Pressure, Air, Adsorption, Biochemical oxygen demand, Turbidity, Oxidation, Organic carbon, Dissolved oxygen, Equipment, Waste water treatment.
Identifiers: Pressure-Recycling Oxidation Sewage Treatment(PROST).

The PROST (Pressure-Recycling Oxidation Sewage Treatment) system was described. This system provided the advantages of pressure digestion with air and/or oxygen as well as several improvements. Pressure digestion increased the speed of oxygen adsorption and the extent of digestion. Unit size and land requirements were reduced, and the character of the final effluent liquid and sludge was improved. This system's predissolved oxygen produces such calm oxidation that the unit may be concurrently used as a clarifier. Waste waters were depressurized after depletion of the dissolved oxygen. Other gases dissolved at the elevated pressure were then released. Process repetition dissolved the oxygen necessary to supply practically all of the BOD. The influent sewage entered a centrifugal pump and was mixed with air and/or oxygen. The liquid passed to the pressure vessel which acted as an organics digester. Most of the organic material was oxidized or digested by chemical, enzymatic, or aerobic bacterial action. The liquid overflowed the top of the pressure tank. There was an 80-90% BOD reduction and minimal turbidity. Sludge was discharged as the conventional underflow. Added BOD and turbidity reduction was possible by retreatment. Sludge recycling oxidized some of the organic carbon. A compact version was described which used a single vessel for BOD supply and clarification involving solid-liquid contacting. (Collins-FIRL)
W77-10608

SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5E.
W77-10609

STANDARDIZATION FOR WATER POLLUTION CONTROL WORKS,
D. O. Lloyd.
Water Pollution Control, Vol 76, p 173-181, 1977. 2 fig, 4 tab, 14 ref, 3 append.

Descriptors: *Water pollution control, *Treatment facilities, *Design standards, Equipment, Filters, Sludge treatment, Mechanical equipment, Performance, Construction, Waste water treatment.

Factors involved in the standardization of treatment facilities were considered. The goals for water pollution control facilities were: use of standard design procedures; use of standard equipment and machinery; construction of standard treatment units; improved performance appraisal; and avoidance of cosmetic additions while encouraging innovation. It was considered most important to avoid weak standards which would impair performance and confidence in the standardized forms. Standardized preliminary treatment processes, sedimentation units, biological filters, sludge digestion, and mechanical equipment were expected to produce significant benefits. More effective standards could be determined by cooperation between designers, manufacturers, and users. (Collins-FIRL)
W77-10610

CHEMISORPTION OF PHOSPHORUS FROM PRECLEANED MUNICIPAL SEWAGE (VERFAHREN ZUR ABSORPTIVEN PHOSPHORELIMINATION AUS VORGEREINIGTEM KOMMUNALEM ABWASSER),
N. Klaentschi.
Gas-Wasser-Abwasser, Vol. 57, No. 5, p 379-384, 1977. 6 fig, 5 tab, 12 ref.

Descriptors: *Phosphorus, *Absorption, Separation techniques, Municipal wastes, Economics, Treatment facilities, Organic carbon, Water purification, Turbidity, Waste water treatment.

A treatment process for phosphorus removal was presented. This process based on chemisorption, can produce sewage effluents with phosphorus concentrations of 0.1 mg P/liter. A pilot plant operation indicated that the process was technically and economically feasible for municipal effluent treatment. The process also reduced organic carbon and turbidity. A significant improvement was projected for treatment plants already using phosphate precipitation. (Collins-FIRL)
W77-10611

CLEANSING THE RIVER TYNE,
Northumbrian Water Authority, Gosforth (England).
W. B. Norgrove.
Chemistry and Industry, No. 9, p 344-348, May 1977. 3 fig, 1 tab, 4 ref.

Descriptors: *Water pollution control, *Rivers, Sewage disposal, Treatment facilities, Sludge, Overflow, Design criteria, Sewers, Waste water treatment, Planning.
Identifiers: Tyne River(England).

Efforts to reverse the effects of pollution in the River Tyne, England, were reviewed. The river has received wastes from the coal and iron industries since the 19th century. Its self-purification and re-oxygenation capacities have been negated. Crude sewage from 88% of the population is directly discharged to the river; sewage from 7% is discharged through outfalls; 5% receives some treatment. Sea water and fresh water in the river produce an upstream bottom flow which traps much of the organic solid pollution. A long sea outfall was determined to be economically unfeasible. A two-site treatment system with interceptor sewers was chosen. Liquid crude sludge will be disposed at sea by tankers. New interceptor sewers are being constructed and designed to accommodate a population of 1.3 million and associated industrial influents. A vortex type overflow will be used, in areas where steep gradients and super critical flow velocities exist, to separate the initial combined flow. A progress report on construction, which began in 1973, was provided. The projected cost for this effort was expected to be about 142 million pounds. (Collins-FIRL)
W77-10613

PRELIMINARY INVESTIGATIONS IN WATER TREATMENT WITH HIGH ENERGY ELECTRON BEAMS,
Paris-5 Univ. (France).
C. Gallien, P. Icre, C. Levaillant, and A. Montiel.
Radiation Physics and Chemistry, Vol. 9, No. 4-6, p 775-787, 1977. 2 fig, 5 tab, 17 ref.

Descriptors: *Irradiation, *Chemical reactions, *Genetics, *Radioactivity effects, Pathogenic bacteria, Coliforms, Streptococcus, Amphibians, Hydrogen ion concentration, Nitrites, Chemical analysis, Waste water treatment, Ionization.
Identifiers: P. waltlii, K. pneumoniae.

An investigation of high energy electron beam waste water treatment was presented. The aspects of this treatment were considered. The effects of treated water on biological processes were tested. Studies were conducted to determine chemical changes in the treated water. The question of adequate pathogen reduction, as well as optimum doses for this purpose, was investigated. An industrial irradiator was used which uniformly scanned a width of 400 millimeters with a maximum energy of 6 MeV and passage speeds of 0.12-12 meters/mn. Radiation was adjustable from 100 drads to 5 Mrads. Biological tests were conducted on embryonic development of the amphibian Pleurodeles waltlii (Michahelles). No perturbations in embryo development resulted from water treated with doses of 100 krads to 2 Mrads. There were no caryotype aberrations or mutagenic effects noted in the embryos grown in treated water samples. A 'tanning' effect on the egg chorion may have resulted from chemical modification. Chemical analysis revealed no significant pH changes and minor chemical changes such as an increase in the nitrite ion concentration. Bacterial studies were conducted with E. coli, K. pneumoniae, and S. faecalis. The doses used were 200 krads and 1 Mrad. A dose of 200 krads completely destroyed the enterobacteria and produced a 99.93% reduction of S. faecalis. Data suggested that dose selection was only dependent upon the sterilization threshold objectives for a particular application and upon economic considerations. Irradiation was judged more satisfactory, from a biological standpoint, than chemical treatment. (Collins-FIRL)
W77-10614

SLUDGE PASTEURIZATION BY HEAT AND IONIZING RADIATION. RESULTS OF A STUDY FOR THE EFFLUENTS PURIFICATION PLANT, BERN-NEUBRUECK (SCHLAMMHYGIENISIERUNG DURCH WAERME UND IONISIERENDE STRAHLEN: ERGEBNISSE EINER VERFAHRENSSTUDIE FUER DIE ARA BERN-NEUBRUECK),
J. Huber, and M. Meyer.
Gas-Wasser-Abwasser, Vol 57, No 5, p 385-394, 1977. 8 fig, 1 tab, 22 ref.

Descriptors: *Irradiation, Gamma rays, Filtration, Sedimentation, Physical properties, Economics, Sludge treatment, Evaluation, Costs, Waste water treatment.
Identifiers: Pasteurization, Electron irradiation.

The Bern-Neubrueck waste water treatment plant was designed to provide sludge for agricultural applications. Three sterilization processes were evaluated for a flow of 313 cu m/day. One option was pasteurization at 70C for 30 minutes. Another was radiation with high energy electrons with an energy of 1 MeV at a dose of 300-400 krad. The third alternative was gamma irradiation with cobalt -60, using the batch process, at 300-400 krad. Data were presented on filtration and sedimentation characteristics of the treated sludge. Gamma irradiation was eliminated on the basis of economics. Since pasteurization and electron irradiation had approximately the same costs, a final decision should be based on other parameters. Electron irradiation might be more suitable for the Bern area because irradiated sludge is less odoriforous than pasteurized sludge. (Collins-FIRL)
W77-10615

REMOVAL OF ORGANIC RESIDUAL MATTER FROM EFFLUENTS WITH THE AID OF MACROPOROUS ADSORPTION RESINS (ENTFERNUNG VON ORGANISCHEN RESTSTOFFEN AUS ABWAESSERN MIT HILFE VON MAKROPOROESEN ADSORBERHARZEN),
Technische Universitaet, Hanover (West Germany). Institut fuer Siedlungswasserwirtschaft.
H. Rueffer, and J. Schilling.
Vom Wasser, Vol. 47, p 155-177, 1977. 19 fig, 7 tab, 27 ref.

Descriptors: *Organic compounds, *Adsorption, *Ion exchange, *Resins, Industrial wastes, Domestic wastes, Equations, Separation techniques, Sewage effluents, Waste water treatment.

Pilot and laboratory studies were performed to investigate the use of macroporous ion exchange resins for the removal of organic compounds from domestic and industrial sewage. Organic matter reductions up to 90% were evident after a 30-60 minute contact period. Large surface concentrations were found through equilibrium adsorption tests, especially with high concentrations of industrial waste water. Freundlich isotherms indicated an increased adsorption capacity when waste water concentrations were increased. Further study of the regeneration process was suggested. (Collins-FIRL)
W77-10617

DESTRUCTION OF COLIFORMS IN WATER AND SEWAGE WATER BY DYE-SENSITIZED PHOTOOXIDATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Dept. of Soils and Water.
A. J. Acher, and B. J. Juven.
Applied and Environmental Microbiology, Vol. 33, No. 5, p 1019-1022, May, 1977. 3 tab, 4 ref.

Descriptors: *Coliforms, *E. coli, *Oxidation, *Photoactivation, *Dyes, Sewage bacteria, Enteric bacteria, Bactericides, Sewage treatment, Waste water treatment.
Identifiers: Methylene blue, Rose bengal.

A method for the reduction of virus and fecal coliform concentrations in sewage water by oxidation of organic matter by photosensitization was described. Samples of waste water containing Escherichia coli to which dye-sensitizers had been added were subjected to solar radiation. The effect of the presence of methylene blue on E. coli was measured over various concentrations, radiation times, and sunlight intensities. Increasing the methylane blue concentration up to 5.0 mg/liter increased the bactericidal effect on both potable water and sewage water. Rose bengal was not as effective at destruction of E. coli under similar conditions. For methylene blue, concentration and radiation time were more important than sunlight intensity in efficiency of photooxidation. The dye sensitizers can be removed from effluent by adsorption on bentonite. (Schulz-FIRL)
W77-10618

MIAMI PLANS INJECTION WELL FOR WASTEWATER DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-10619

POLYMERS ARE PRECISELY MANAGED,
Cleveland Regional Sewer District, Ohio.
J. Donahue.
Water and Wastes Engineering, Vol. 14, No. 6, p 58-61, June, 1977. 1 fig.

Descriptors: *Phosphates, *Nutrient removal, *Polymers, *Flow measurement, *Flow control, Municipal wastes, Phosphorus compounds, Pumping, Control systems, Automatic control, Waste water treatment.
Identifiers: Cleveland(OH).

The Easterly Wastewater Treatment Plant in Cleveland, Ohio, uses an efficient and economical method for phosphate removal from waste water. Pumping of a polymer solution to primary sedimentation tanks and secondary tanks is precisely controlled by automatic comparisons of actual flow rate of raw sewage with polymer flow. (Schulz-FIRL)
W77-10620

ANGLIAN OPENS ITS LARGEST SEWAGE TREATMENT WORKS.
Surveyor, Vol. 149, No. 4431, p 6-7, May, 1977. 1 fig.

Descriptors: *Activated sludge, *Biological treatment, *Tannery wastes, *Waste water treatment, *Filters, Industrial wastes, Sludge treatment, Sludge disposal.
Identifiers: England, East Anglia, Anglian Water Authority, Great Billing(UK).

Overloading of an existing activated sludge plant at Great Billing in East Anglia, England has led to the construction of additional sewage treatment facilities. An increasing proportion of industrial effluent from the area's tanning industries and fluctuations in load indicated the need for extensions to existing facilities. A two-stage filtration system including high rate and biological filters was installed to produce effluent that complies with Royal Commission standards. The treatment facility includes provisions for storm flow and diurnal variations in flow. After primary settlement is completed, the settled sewage is then divided between the original activated sludge plant and the new biological filtration plant. Modifications to the original plant include cleaning of dome diffusers in the aeration plant. The sludge treatment and disposal facilities at Great Billings are now the largest existing facilities in the Anglian Water Authority. (Schulz-FIRL)

W77-10621

GROWTH AND BENEFITS OF LOW SPEED CONFIGURATION,
E. J. Guidi.
Water and Sewage Works, Vol. 124, No. 6, p 66-70, June, 1977. 3 fig, 7 tab.

Descriptors: *Sewage disposal, *Centrifugation, *Dewatering, *Sludge treatment, *Equipment, Cost comparisons, Sewage sludge, Drying, Waste treatment, Waste water treatment, Solid wastes.

High speed centrifuges have been used for the dewatering of raw and digested sludge. New developments which indicate that low speed centrifuging may be sufficient for dewatering purposes include: greater quantities of biological slimes which resist compaction at high speeds, more effective polymers for flocculation and dewatering of biological sludges, and a growing need for energy conservation. Advantages offered by the low speed design include less turbulence and resuspension, longer residence time, greater solids compaction, and better clarification and conveyability. Cost analyses for low and high speed centrifuging yield a cost of $12.33/ton of sludge processed by the low speed unit as compared to a cost of $27.93/ton for the high speed centrifuge. Noise levels, polymer consumption, energy use, and maintenance expenditures were also reported to be lower for the low speed unit. (Schulz-FIRL)
W77-10622

IRRIGATION TRIAL WITH MORRO BAY WASTEWATER,
California Univ., Davis. Cooperative Extension.
W. E. Wildman, R. L. Branson, J. M. Rible, and W. E. Cawelti.
California Agriculture, Vol. 31, No. 5, p 36-37, May, 1977. 2 fig.

Descriptors: *Irrigation practices, *Infiltration rates, *Irrigation effects, *Sodium, *Water reuse, Irrigation programs, Soil contamination, Agriculture, Grasses, Soil chemical properties, Waste water disposal, Waste water treatment.
Identifiers: Morro Bay(CA).

While upgrading its sewage treatment plant, the community of Morro Bay considered reuse of treated waste water for irrigation of field and forage crops as an alternative to ocean disposal of effluent. An irrigation trial was carried out using three types of treatment: (1) effluent, (2) effluent plus gypsum, and (3) city water comparable to normal irrigation water. All plots were irrigated weekly, receiving a total of 17 feet of water by the end of the project. Soil samples were collected at various stages during the irrigation and analyzed for their sodium adsorption ratios to determine whether sodium added by the effluent posed an irrigation hazard. Effluent water did raise the sodium adsorption ratios, but the addition of gypsum tended to lessen this effect. Infiltration tests showed no consistent differences between city and effluent waters. It was suggested that guidelines for sodium contamination by irrigation waters be reevaluated for sewage effluents. (Schulz-FIRL)
W77-10623

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
L. M. Harwood.
California Agriculture, Vol. 31, No. 5, p 37-38, May, 1977. 1 fig.

Descriptors: *Irrigation practices, *Irrigation effects, *Water reuse, *Forage grasses, *Dairy industry, Irrigation effects, Fertilizers, Nitrogen, Phosphorus, Agriculture, Grasses, Waste water disposal, Soil chemical properties, Soil physical properties, Waste water treatment.
Identifiers: Sonoma County(CA).

Irrigation of forage crops with treated waste water in Sonoma County, California has been evaluated. Effluent supplied by the city of Santa Rosa for irrigation may have economic and other benefits for the area. Soil analyses over the three year test period indicated only minor changes, including slight increases in soil conductivity, phosphorus content, and pH. As nearly all soil types in Sonoma County are deficient in nitrogen and phosphorus, use of effluent for irrigation may significantly reduce fertilizer costs. Compaction of heavy clay soils could be alleviated by more frequent irrigations with smaller amounts of water. Concentrations of elements toxic to plant growth or animal health were not significant in the waste water used in Sonoma County. (Schulz-FIRL)
W77-10624

COMBINED PROCESSING OF WASTEWATER AND SOLID WASTE,
Brown and Caldwell, Walnut Creek, Calif.
R. B. Sieger, and B. D. Bracken.
AIChE Symposium Series, Vol. 73, No. 162, p 143-149, 1977. 4 fig, 1 tab, 5 ref.

Descriptors: *Energy, *Salvage value, *Fuels, *Recycling, *Sludge, *Sludge disposal, *Solid wastes, Waste treatment, Waste water treatment, Municipal wastes, Metals, Costs.
Identifiers: California, Refuse derived fuel, Sludge burning, Pyrolysis.

A design for a combined waste water and solid waste processing facility has been successfully tested and approved for the Central Contra Costa Sanitary District in northern California. This design puts an emphasis on energy recovery to reduce purchased energy requirements. Incoming solid wastes, 1089 mg/day at plant capacity, are sent to landfill sites or to the processing plant depending on their salvageability. At the process plant the wastes are salvaged for ferrus metals and aluminum. Air classifiers divide the initially shredded wastes into light and heavy fractions. The heavy fraction, primarily non-combustibles, is examined for metals. The light fraction, sent through a second hammermill-type shredder, yields RDF (refuse derived fuel) for use in sludge burning at the water treatment plant. The plant uses a physical-chemical-biological waste water treatment process including lime recalcination and sludge buring. The RDF, mixed with sludge in rations controlled for both optimal furnace operation and plant energy needs, is fed into the 11-hearth sludge burning furnaces. Pyrolysis rather than incineration is used, yielding a gas to be used as a fuel in the lime recalcination furnace. Exhausts from the furnace are passed to a waste heater boiler to generate steam for the plant's cooling and heating needs and for the driving of turbines for several mechanical devices. While laboratory testing of this system showed several problems, these were due to the small scale of the test. A full-scale test gave results exceeding expectations. (Pfeifer-FIRL)
W77-10625

BIOLOGICAL NITRIFICATION IN CONTACT AERATION SYSTEMS,
M. F. Abd-El-Bary, and M. J. Eways.
Water and Sewage Works, Vol. 124, No. 6, p 91-93, June, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: *Aeration, *Nitrification, *Biological treatment, *Ammonia, *Sewage, Waste water treatment, Waste treatment, *Aerobic treatment, Sewage treatment, Effluents.

A contact aeration unit can achieve a high degree of biological nitrification. The system investigated was a fixed film type capable of biologically nitrifying ammonia at rates of up to 0.8 lb/day per 1000 square feet of surface area. This system, which provides a fixed surface area for attachment of the biological mass, is contrasted with a suspended growth system (an activated sludge type system). Advantages of the contact aeration system include: nitrification at pH levels of normal domestic sewage; flow by gravity, making the plant less power-consuming; automatic plant operation; and quick recovery by plants after shock loading. Data were collected over a three month period, with the temperature ranging from 71 F to 72 F and pH varying between 7.0 and 7.4. Portions of the final effluent of a 0.8 MGD capacity contact aeration plant were pumped to the first stage aeration unit of a 0.3 MGD plant. Analyses of grab samples taken along the length of the aeration tank showed the rate of nitrification to be a linear function of the tank length. Thus, the data indicate that the nitrification rate is a zero order reaction (using the Monod Model) and independent of ammonia concentration. (Pfeifer-FIRL)
W77-10626

PRETREATING AN ACID WHEY WASTE FOR SEWER DISCHARGE,
E. S. Hopkins, H. G. Angle, and H. C. Zigler.
Public Works, Vol. 108, No. 6, p 58-61, June, 1977. 1 fig, 2 tab, 4 ref.

Descriptors: *Industrial wastes, *Acidity, *Effluents, *Aeration, *Biological treatment, *Food processing wastes, *Microbial degradation, *Anaerobic conditions, Waste treatment, Waste water treatment, Sewer systems, Sewerage, Nitrogen, Oxygen, Absorption, Fermentation.
Identifiers: Frederick(MD), Cottage cheese wastes.

Treatment methods for converting acid cottage cheese manufacturing wastes to effluent acceptable for discharge into the Frederick, Maryland sewer system are discussed. Initial experiments with an industrial effluent consisting of equal parts whey and rinse water discharge after a six hour holding period showed BOD levels of 14,700 mg/liter, with 300 mg/liter being an acceptable level. Laboratory, field, and pilot plant studies were undertaken using air-microbiological procedures. Organisms from discharged raw sour milk were used as seed. Maintenance of proper nitrogen levels (7 mg/liter) and oxygen supplies was required for the organisms to destroy the whey wastes. Maintaining sufficient oxygen levels was the major practical difficulty, with absorptions per hour limited under procedure conditions. Anaerobic conditions induced fermentation with its consequent odor problems. Quantity of waste degraded was in direct proportion to quantity of oxygen absorbed, indicating the practicality of the air-microbiological approach. Air was supplied to the system both by a surface aerator and a diffuser ring at the bottom of the tank. (Pfeifer-FIRL)
W77-10627

SOILS INFILTRATION AND EVAPORATION OF WASTEWATER BY AEROBIC PROCESSES,
A. N. Young, Jr.
Institute of Environmental Sciences. Proceedings of the 23rd Annual Technical Meeting, p 115-117, April 25-27, 1977. 4 ref.

Descriptors: *Aerobic treatment, *Microorganisms, *Bacteria, *Septic tanks, *Transpiration, Sewage, Waste treatment, Waste water treatment, Water quality control.

The advantages of alternative disposal systems involving aerobic processing over those of conventional septic tank drainage field installations are discussed. Maintaining aerobic conditions allows the development of proper microorganisms which prey on anaerobic bacteria, the primary cause of soil clogging in on-site sewage treatment systems. Thus even in difficult soils porous conditions can be maintained and clogging prevented, while septic tank systems show a 50% failure rate within 2 years of installation. Alternate systems can efficiently oxidize waste water nutrients, permitting their soil retention or uptake by vegetation and meeting EPA requirements for 1984 systems.

Alternate systems meet federal requirements for maintaining safe drinking water that septic tank systems cannot. the importance of proper construction and maintenance of the aerobic treatment equipment and the evapo/transpiration bed is stressed as critical to the success of the system. The ability of this type of absorption bed to hold water over long periods of rainfall is maintained by proper sizing of the bed. (Pfeifer-FIRL)
W77-10628

KRAKSTAD WASTE WATER FACILITY: THE FIRST TO BE EQUIPPED WITH CONTACT ROLLS FOR BIOLOGICAL PURIFICATION (KRAKSTAD RENSEANLEGG FORST MED KONTAKTVALSER TIL BIOLOGISK RENSING),
J. O. From.
Teknisk Ukeblad/Teknikk, Vol. 124, No. 16, p 21-22, April, 1977.

Descriptors: *Biological treatment, *Treatment facilities, *Bacteria, *Sludge treatment, Waste water treatment, Costs, Water purification, Sewage treatment.
Identifiers: Krakstad(Norway), Contact rolls.

A novel chemical and biological waste water treatment plant, designed for 1,500 persons in Krakstad, Norway, is described. After mechanical impurities are separated on sieves, biological purification is done by means of two cylinders measuring 3 m in diameter and about 5 m in length. These cylinders, partly immersed in the waste water horizontally, consist of 300 styropor/isopor discs, and have a surface of 4,200 sq m each for the bacterial cultures needed to purify the water. Consequently, there is no return sludge. The sludge obtained after biological purification and subsequent chemical flocculation is separated by plate separator. The waste water treatment cost amounts to the equivalent of 800 crowns per inhabitant. (Takacs-FIRL)
W77-10629

SANDVIKA WASTE WATER TREATMENT PLANT IN OPERATION. EXPERIENCE WITH DESIGN, CONSTRUCTION, AND OPERATION (SANDVIKA RENSEANLEGG I PRAKSIS. ERFARINGER FRA PLANLEGGING, BYGGING OG DRIFT),
A. Moen.
Teknisk Ukeblad/Teknikk, Vol. 124, No. 16, p 16, 18, 35, April, 1977. 5 fig, 1 tab, 1 ref.

Descriptors: *Treatment facilities, *Municipal wastes, Waste water treatment, Design, Construction, Waste treatment, Sea water.
Identifiers: Norway.

Experience with the operation of a Sandvika-type municipal waste water treatment plant at Baerum, Norway, is reported. After mechanical treatment and sand trapping, flocculation is done with lime (250 g/cu m). Sea-water is used as a source of magnesium (4-5% of the effluent). The sludge, thickened gravimetrically to a solids content of 5.3%, is dewatered by centrifugation. (Takacs-FIRL)
W77-10630

ONE PROCESS STEP CAN BE SKIPPED: BIOLOGICAL-CHEMICAL WASTE WATER TREATMENT PLANT BECOMING CHEAPER (ET PROSESSTRINN KAN SIOYFES: BIOLOGISK-KJEMISKE RENSEANLEGG BLIR BILLIGERE),
P. Nettli, and E. Hustad.
Kjemi, Vol. 37, No. 2, p 40-41, March, 1977. 3 fig, 1 tab.

Descriptors: *Biological treatment, *Iron compounds, *Lime, *Costs, Filtration, Water purification, Sludge treatment, Waste water treatment, Waste treatment.
Identifiers: Bio-Alwafloc.

The Bio-Alwafloc waste water treatment unit developed by Alwatech is described. Filtered waste water is first purified with activated sludge for about 40 minutes. It is then sent into a three-step aerated precipitation-flocculation-flotation unit without preliminary separation of the biological sludge. Trivalent iron salts, and possibly lime and an anionic polyelectrolyte, are added for chemical purification. The combination of biological and chemical separation in one step offers economic advantages without causing any marked reduction of the purification efficiency. (Takacs-FIRL)
W77-10631

ENERGY USAGE AND RECOVERY IN SLUDGE DISPOSAL PART 1,
Stanford Research Inst., Menlo Park.
J. L. Jones, D. C. Bomberger, Jr., and F. M. Lewis.
Water and Sewage Works, Vol. 124, No. 7, p 44-47, July, 1977. 2 fig, 4 tab, 5 ref.

Descriptors: *Sludge disposal, *Sludge treatment, *Energy, *Incineration, *Heat treatment, Waste disposal, Waste water treatment.
Identifiers: Energy reuse.

Relative energy requirements and cost sensitivities to recovered energy value have been compared for various methods of sludge treatment and disposal. Thermal processes such as incineration and pyrolysis are stressed. Trends in thermal processing and the status of existing types of thermal processing are outlined. The production of steam by a waste heat boiler is considered as a means of energy recovery from incineration. The quantity of steam produced was dependent on the sludge solids content and the treatment process used. Use of the recovered steam for the generation of electric power proved to be uneconomical and inefficient, while the use of steam by the sludge heat treatment unit was considered feasible. A comparison of total national per capita energy consumption with energy consumption for waste water treatment indicated that energy use for waste water treatment amounted to less than 0.1% of the total U.S. energy expenditure. (Schulz-FIRL)
W77-10632

ALBUQUERQUE CLOSES WATER-WASTE-WATER CYCLE.
American City and County, Vol. 92, No. 7, p 60, July, 1977.

Descriptors: *Water reuse, *Irrigation water, *Fertilizers, *Water management(Applied), *Water conservation, Water resources development, Water demand, Water supply, Waste water treatment, Waste water disposal, Waste treatment, Sludge treatment, Sludge disposal, Activated sludge.
Identifiers: Albuquerque(NM).

Since water supplies for the Albuquerque area are limited, high-level treatment of waste water for reuse in irrigation and soil conditioning is encouraged. Processing by Albuquerque's two waste treatment plants includes grit removal, primary sedimentation and screening, high-rate trickling filtration, clarification, activated sludge processing, and chlorination. The resultant effluent discharged into the Rio Grande contains less than 30 mg/liter of BOD and 30 mg/liter of suspended solids. Reuse of waste water also allows the city additional groundwater rights to the area's underground aquifer. Problems encountered in waste processing after the activated sludge process was added in 1976 include an increase in sludge volume. Also, as the treatment plant contains no sludge thickening facilities and all sludge is air dried on sand, beds, increased sludge volumes have presented storage problems during periods of unfavorable weather. Additional outlets for reuse and redistribution of dried sludge are currently being sought. (Schulz-FIRL)
W77-10633

WATER TREATMENT PLANT SLUDGES: AN UPDATE OF THE STATE-OF-THE-ART,
G. P. Westerhoff, J. T. Albert, P. W. Doe, H. W. Forster, and P. H. King.
Water and Sewage Works, Vol. 124, No. 7, p 65-66, July, 1977.

Descriptors: *Sludge disposal, *Sludge treatment, *Dewatering, *Waste disposal, *Centrifugation, *Sewage treatment, Waste water treatment.

Methods for the dewaterng of water treatment plant sludges and the ultimate disposal of dewatered sludge are discussed. Mechanical and non-mechanical methods of dewatering are mentioned, including lagoon thickening, sand bed drying, centrifugation, vaccum filtration, and pressure filtration. Recommendations for further research and development are given for the following areas: minimization o sludge volumes; recovery of resources present in sludge, such as alum, lime, magnesium, and iron; and ultimate disposal of sludge in a safe, economical manner. (Schulz-FIRL)
W77-10634

A METHODOLOGY FOR ASSESSING LAND APPLICATION OF SLUDGES AND WASTE-WATERS,
For primary bibliographic entry see Field 5E.
W77-10635

EVALUATION OF THE EFFECTIVENESS OF DEHELMINTIZATION OF WASTE WATER DURING MECHANICAL TREATMENT AT SMOLENSK (OTSENKA EFFEKTIVNOSTI DEGEL' MINTIZATSKII STOCHNYKH VOD PRI MEKHANICHESKOI OCHISTKE V SMOLENSKE),
S. Y. Ashnin, and L. S. Lagutina.
Meditsinskaia Parazitologiia i Parazitarnye Bolezni, Vol. 45, No. 5, p 609-611, 1976. 1 tab.

Descriptors: *Chlorination, *Disinfection, *Worms, *Biocontrol, *Animal parasites, Waste water treatment, Lagoons, Sludge.
Identifiers: Smolensk(USSR), Mechanical treatment, Ascarids.

The effectiveness of mechanical waste water treatment with chlorination in terms of dehelmintization was investigated at the Smolensk waste water treatment plant. Mechanical treatment with chlorination reduced the ascarid egg count by not over 50%. Ascarid eggs were found in non-disinfected sludge in lagoons, both on the surface and at 40 cm depth, 2 years after discharge; 80% of the eggs were viable. The findings indicate the low efficiency of mechanical waste water treatment in terms of the removal of helminths. (Takacs-FIRL)
W77-10636

MULTIFUNCTIONAL APPROACH TO POLLUTION PREVENTION,
Yorkshire Water Authority (England).
For primary bibliographic entry see Field 5G.
W77-10638

A METHOD FOR STUDYING MICROFAUNA OF ACTIVATED SLUDGE (METODA BADANIA MIKROFAUNY OSADU CZYNNEGO),
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
H. Klimowicz.
Gaz, Woda i Technica Sanitarna, Vol. 51, No. 2, p 46-48, 1977.

Descriptors: *Microorganisms, *Activated sludge, *Aeration, *Analytical techniques, Sewage treatment, Sludge treatment, Physical properties, Chemical properties, Performance, Waste water treatment.
Identifiers: Microfauna.

A procedure for the evaluation of sewage purification based on the microfauna in active sediment from the aeration chamber is described. Depending on the consistency of the purification process, samples were taken daily to 2x/week. To arrive at an accurate average count of microfauna, 5 small samples from different portions of the aeration chamber were taken and mixed in a 100 ml bottle 1/4 filled. The sample was aerated every 2-3 hrs and kept in a moderately cool place. The qualitative observation of individual microorganisms was performed with a stereoscopic microscope and, if of particular interest, under a research microscope. After a list of the species noticed was prepared, counting of the individuals was started in a plexiglass counting chamber of the Sedgwick-Rafter type. For the correct interpretation of microscopic analyses, a qualitative-quantitative listing of the fauna observed over a longer period of time (e.g. 1 month) was made up in order to assess changes occurring on sampling dates or of sewage purification levels. It was pointed out that physico-chemical analysis could only give exact values for a limited number of compounds. No simple detection methods were available for numerous chemical compounds able to poison the aqueous environment. Therefore, microscopic analysis of live organisms in the active sediment was essential, since most of the organisms would react to toxic compounds in the plant water which will eventually reach the city's water supply. The importance of the presence of live organisms in the active sediment as a reflection of the efficacy of the sewage purification process was emphasized. (Takacs-FIRL)
W77-10643

PHYSICAL AND CHEMICAL METHODS,
Westvaco Corp., North Charleston, S.C. Charleston Research Center.
A. B. Scaramelli, and F. A. DiGiano.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 992-1001, June, 1977. 90 ref.

Descriptors: *Waste treatment, *Ion exchange, *Adsorption, *Membrane processes, *Oxidation, Municipal wastes, Industrial wastes, Coagulation, Suspended solids, Flocculation, Model studies, Ozone, Irradiation, Kinetics, Water Pollution Control Federation, Waste water treatment.
Identifiers: Physical methods, Chemical methods.

A literature review of current physical and chemical methods of waste treatment is presented. Process applications and pilot studies for various methods of waste treatment and disposal are described. Procedures for clarifiction, coagulation, solids separation, and flocculation are reported. Adsorption capacities and kinetics are discussed for various organic compounds used in waste treatment. Membrane processes such as reverse osmosis, ultrafiltration, and electrodialysis are evaluated. Other topics discussed include ozonation, and ion exchange for the selective removal of heavy metals and organic compounds. (Schulz-FIRL)
W77-10645

ACTIVATED SLUDGE,
Georgia Inst. of Tech., Atlanta.
F. M. Saunders.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1005-1016, June, 1977. 114 ref.

Descriptors: *Activated sludge, *Sludge treatment, *Nitrification, *Sedimentation, Industrial wastes, Microorganisms, Flocculation, Model studies, Biochemical oxygen demand, Phosphorus, Biological treatment, Industrial wastes, Municipal wastes, Organic compounds, Oxygen demand, Kinetics, Suspended solids, Waste water treatment.
Identifiers: Process performance, Process design.

A review of literature on activated sludge treatment methods and processes is presented. Various models for achieving optimal efficiency and specific effluent standards are outlined. Topics discussed include process performance, process design, oxygen uptake and transfer, sedimentation, nitrification, industrial waste waters, and microbial studies. Among the processes described are: extended aeration, settling, phosphorus removal, biodegradation, oxidation, and denitrification. Methods for detoxification of activated sludge are reported. (Schulz-FIRL)
W77-10646

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark.
R. I. Dick.
Journal Water Pollution Control Federation, Vol. 49, No. 6, p 1040-1067, June, 1977. 345 ref.

Descriptors: *Sludge treatment, *Sludge disposal, *Industrial wastes, *Chemical wastes, *Reclamation, Stabilization, Dewatering, Sedimentation, Water Pollution Control Federation, Microorganisms, Viruses, Incineration, Transportation, Fertilizers, Land reclamation, Landfills, Lagoons, Ultimate disposal, Municipal wastes, Activated sludge, Biodegradation, Waste water treatment.
Identifiers: Ocean disposal, Conditioning.

A review of literature on various methods of sludge treatment, utilization, and disposal is presented. Sludge management technology, operational costs, and energy costs are discussed for alternative sludge processing techniques. Topics discussed include quantity and quality of sludge, industrial and hazardous sludges, chemical sludges from phosphorus removal and water treatment, stabilization, conditioning, thickening, dewatering, inactivation of organisms and viruses, combustion, and pyrolysis. Various topics related to waste disposal are discussed, including reclamation, transportation of sludge, land application, land reclamation, landfills and lagoons, and ocean disposal. (Schulz-FIRL)
W77-10647

CURRENT TRENDS IN WATER RECLAMATION TECHNOLOGY,
Los Angeles County Sanitation Districts, Whittier, Calif.
W. E. Garrison, and R. P. Miele.
American Water Works Association Journal, Vol. 69, No. 7, p 364-369, July, 1977. 3 fig, 6 tab, 11 ref.

Descriptors: *Water reuse, *Water resources development, *Water management(Applied), *Groundwater recharge, Groundwater resources, Microorganisms, Organic compounds, Inorganic compounds, Suspended solids, Metals, Phosphorus, Demineralization, Phosphates, Heavy metals, Activated carbon, Ozone, California, Reclamation states, Nitrogen, Waste water treatment.
Identifiers: Los Angeles(CA).

Waste water reclamation and reuse is of particular interest for areas where water supplies are limited, such as in arid southern California. The Los Angeles Sanitation Districts have identified several potential uses for reclaimed waste water, including groundwater recharge, industrial reuses, irrigation, and recreation. Constitutents in waste water causing the most concern are inorganics (metals, nitrate, phosphorus, and TDS), organics (trace organics, pesticides, and color), microorganisms, suspended solids, and turbidity. Various methods for the removal of inorganic constitutents are described, including: demineralization by reverse osmosis, electrodialysis, and ion exchange; nitrogen removal by nitrification and denitrification; phosphate removal; and heavy metals removal. Activated carbon and ozonation are methods for the removal of organic material in waste water. Microorganism removal by disinfection and various tertiary treatment processes are described. The use of filtration and tertiary treatment processes is considered for the removal of suspended solids and turbidity. Cost estimates are presented for treatment processes necessary for the various modes of reuse. Groundwater recharge is indicated as the most economically feasible form of reuse by directly decreasing the amount of water which must be imported. The need for standard regulations governing water reuse is indicated. (Schulz-FIRL)
W77-10649

BIOLOGY AND BIOTECHNOLOGY OF WASTE WATER TREATMENT (BIOLOGIE UND BIOTECHNOLOGIE DER ABWASSERAUFBEREITUNG),
H. P. Hoffmann-Walbeck.
Zucker, Vol 30, No 4-5, p 204-209, April-May, 1977. 10 fig, 2 tab, 9 ref.

Descriptors: *Activated sludge, *Biochemical oxygen demand, *Sludge treatment, *Biodegradation, *Bacteria, Aerobic digestion, Anaerobic digestion, Fermentation, Filtration, Biological treatment, Carbohydrates, Waste water treatment.

Biological processes and requirements are described for various methods of waste water treatment. Methods for aerobic and anaerobic digestion are discussed. Factors affecting the efficiency of the activated sludge treatment for carbohydrate-rich waste waters are outlined. Biochemical oxygen demands are evaluated at various temperatures and flow rates. Various forms of bacteria found in activated sludge are described. (Schulz-FIRL)
W77-10650

DIRECT FILTRATION,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, Calif.
R. L. Culp.
American Water Works Association Journal, Vol 69, No 7, p 375-378, JUly, 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Filtration, *Coagulation, *Polymers, *Water quality, *Waste water treatment, Flocculation, Separation techniques, Filters, Cost comparisons, Turbidity, Equipment.
Identifiers: Direct filtration, Flow sheets.

Direct filtration may be a viable treatment process for raw waters that are free of paper fiber and low in turbidity, color, plankton, and coliform organisms. As defined, direct filtration is a process in which filtration is not preceded by sedimentation. Flow sheets are illustrated for several types of filtering arrangements. The mechanisms by which coagulation during direct filtration removes turbidity and color are described. Possible applications and criteria for the use of direct filtration processes in waste water treatment are presented. The use of direct filtration results in reductions in capital, operating, and maintenance costs as well as smaller sludge volumes. Disadvantages include the high levels of turbidity, color, plankton, or paper fiber and the need for greater operator surveillance to insure proper effluent quality. Process design and operations are discussed, including filter media and dimensions. Criteria for quality control are presented for the control of the coagulant dosage and the use of polymers as filtering aids. Municipalities currently employing direct filtration are listed, including a partial survey of designs and processes in operation. (Schulz-FIRL)
W77-10651

CHLORINATION SEEMS BEST FOR REMOVING SUSPENDED SOLIDS FROM LAGOON EFFLUENTS,
Gilbreath, Foster and Brooks, Inc., Tuscaloosa, Ala.
R. B. Harrison, and J. K. Haddock.
Water and Wastes Engineering, Vol 14, No 5, p 48-82, May, 1977. 4 fig, 4 tab.

Descriptors: *Suspended solids, *Algae, *Chlorination, *Coagulation, *Sedimentation, Lagoons, Oxidation lagoons, Biochemial oxygen demand, Coliforms, Waste water treatment, Model studies, Alabama, Flocculation, Effluents, Filtration.
Identifiers: Vernon(AL).

Among the problems encountered with the use of lagoons or holding ponds are the periodically high levels of BOD, algae, and fecal coliform bacteria found in lagoon effluents. In this study on the improvement of an existing 3-celled lagoon in Vernon, Alabama, four effluent treatment schemes were evaluated. The first method investigated was chlorination using a chlorine contact chamber (reactor). It appeared to be the best method for reduction of BOD, destruction and settling of algae, and elimination of fecal coliform bacteria. The effluent and chlorine were fed into a model reactor chamber by means of gravity flow and detained for 2 hours. The model system was effective at removing 68% of the BOD, 63% of the solids, and 100% of the fecal coliform from the lagoon effluent. Coagulation-precipitation with alum, the second method investigated, removed as much as 83% of the solids but did not appreciably reducc BOD or coliform levels. A major disadvantage of this method was the production of large volumes of sludge which would require additional processing. Plain sedimentation, the third method examined, did not prove satisfactory, resulting in a small percentage of removal of suspended solids and non reduction of BOD or fecal coliform levels in the effluent. The fourth method, sand filtration, was considered to be adequate from other source studies. (Schulz-FIRL)
W77-10652

EFFECT OF ALUM ADDITION ON AEROBIC DIGESTION OF ACTIVATED SLUDGE,
G. F. Mitchell, R. H. Seyfarth, and F. R. Wilson.
Water and Sewage Works, Vol 124, No 7, p 58-62, July, 1977. 10 fig, 4 ref.

Descriptors: *Phosphorus, *Activated sludge, *Aerobic digestion, *Biochemical oxygen demand, *Aeration, Stabilization, Sludge treatment, Chemical oxygen demand, Waste water treatment.

A study was conducted to determine if alum addition to the aeration tank for phosphorus removal affected the aerobic digestion process. Results indicated that the addition of 13 mg/liter of alum had no effect on the volatile suspended solids reduction rate and little effect on the metabolic processes. Increases in specific oxygen uptake rate and specific resistance were observed during the first two days of aeration, possibly due to an increase in external substrate through cell lysis. Levels decreased after the fifth day of aeration to those of the control system (without alum), suggesting that the addition of alum at the experimental concentration does not significantly affect the efficiency of the aerobic digestion process. (Schulz-FIRL)
W77-10653

OPTIMIZING GAS PRODUCTION, METHANE CONTENT, AND BUFFER CAPACITY IN DIGESTER OPERATION,
University of Southern California, Los Angeles. Environmental Engineering Program.
N. Brovko, K. Y. Chen, M. S. Weinberg, and N. R. Barber.
Water and Sewage Works, Vol 124, No 7, p 54-57, July, 1977. 4 fig, 4 ref.

Descriptors: *Methane, *Alkalis, *Bicarbonates, *Sludge digestion, *Anaerobic digestion, Sludge treatment, Hydrogen ion concentration, Chemcontrol, Waste water treatment.
Identifiers: Buffers.

Carbonate equilibria and buffering capacities are evaluated for the production of methane during anaerobic digestion, to determine whether increasing bicarbonate concentrations above levels required for pH control could increase gas production and/or the methane content of gas produced. Results suggested that bicarbonate, used for its buffering capacities, may also stabilize the biological system, promoting more complete digestion and increasing methane production according to a linear function. Sodium bicarbonate was indicated as the source of bicarbonate alkalinity least likely to disturb the biological community. Reestablishing proper carbonate alkalinity was essential in the recovery of a malfunctioning digester. Total alkalinity concentrations must be corrected for volatile acid alkalinity to obtain accurate values for bicarbonate alkalinity, as high values for volatile acid alkalinity can yield negative values for bicarbonate alkalinity. The use of somewhat higher levels of bicarbonate alkalinity in sludge digestion than those required for buffering (3500-5000 mg/liter instead of 2500 mg/liter) was recommended to provide additional safeguards and increase methane production. (Schulz-FIRL)
W77-10654

WASTEWATER MANAGEMENT IN THE SOLID WOOD AND BOARD PRODUCTS INDUSTRIES: A REVIEW,
Mississippi State Univ., Mississippi State. Forest Product Lab.
W. S. Thompson.
In: ACS (American Chemical Society) Symposium Series 43, American Chemical Society, Washington, D.C., p 348-363, 1977. 2 fig, 3 ref, 6 tab.

Descriptors: *Waste water treatment, *Reviews, *Water pollution, Waste treatment, Industrial wastes, Pulp wastes, Water pollution treatment, Water pollution sources, Saw mills, Pulp and paper industry, Wood preservatives(Pesticides), Flocculation, Filtration, Biological treatment, Waste treatment, Water quality standards, United States Legislation, Regulation, Pollution abatement, Water management(Applied).
Identifiers: *Wood products industry, Wood particle board, Insulation board, Veneer, Plywood.

Water pollution problems of the wood-using industries in the U.S.A. are reviewed, along with current effluent standards and technologies available to meet government regulations in various industry segments, including sawmills, particle board, insulation board, veneer, and plywood factories, pulp and paper mills, and wood impregnation (preservation) plants. Under present federal guidelines, industry must install the best practicable treatment and control technology currently available by July 1, 1977, and the best available treatment and control technology economically achievable by July 1, 1983. A zero discharge has been judged by the Environmental Protection Agency to be both practicable and economically attainable for most subcategories of the wood products industry. Those subcategories that are permitted some discharge under present standards include wet fiber processing and one segment of the wood preserving industry. Control of pollutant discharge is being accomplished by in-plant process modifications that reduce the volume of generated waste water and by effluent-purification including flocculation and filtration, followed by biological treatment. (Brown-IPC)
W77-10690

PREVENTION OF SCALE FORMATION IN EVAPORATOR CHAMBERS (USTRANYAT' OBRAZOVANIE NAKIPI V KAMERAKH VYPARNOI STANTSII),
Krasnodarskii Politekhnicheskii Institut (USSR).
L. I. Matskevich.
Bumazhnaya Promyshlennost, No 1, p 25, January, 1977. 1 fig, 1 tab.

Descriptors: *Pulp wastes, *Scaling, *Evaporators, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Pulp and paper industry, Corrosion control.
Identifiers: *Black liquor, *Magnetic fields, *Kraft mills.

The formation of difficulty removable compact scale deposits on kraft mill evaporator tubes can be prevented by subjecting the entering black liquor to the action of a magnetic field. The liquor is passed through a variable magnetic field perpendicularly to the magnetic lines at a rate of 0.12-0.6 m/sec, at a magnetic induction in the gap of 2.5-4.5 T and 25-75 pairs of alternating poles. Under these conditions, a porous loose precipitate is formed instead of a compact scale, which can be easily removed mechanically. (Stapinski-IPC)
W77-10691

FOAM BREAKING--A KEY PROCESS IN DETOXIFICATION OF KRAFT MILL EFFLUENTS BY FOAM SEPARATION,
British Columbia Research Council, Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
Canadian Society for Chemical Engineering Conference, October 4-6, 1976, Toronto, Canada, Preprint of Conference Paper, 30 p. 7 fig, 14 ref, 4 tab.

Descriptors: *Toxicity, *Pulp wastes, *Foam separation, *Waste water treatment, Wastes, Industrial wastes, Pulp and paper industry, Water pollution treatment, Water pollution sources, Turbines, Separation techniques, Pilot plants, Capital costs, Water pollution control, Waste treatment, Design criteria, Effluents.
Identifiers: *Kraft mills.

A study was made to demonstrate on a pilot-plant scale the performance of a turbine foam breaking system for detoxifying kraft mill effluents and to develop the design parameters for large-scale application. Among various configurations, a 3-blade vaned-disk turbine was found to be optimal for foam breaking. Major process variables controlling foam breaking were system design, tip velocity, rotation speed, and foam load. A foam breaking system with only restricted liquid drawoff performed 3-16 times better than a conventional flow-through system. A 38-cm diameter turbine operating at 1800 rpm (3600 cm/sec tip velocity) collapsed up to 1.2 cu m (42 cu ft) of foam/min. Design equations developed for sizing of foam breakers suggest that a 61-cm (2-ft) diameter, 21-kw turbine will collapse 4.7 cu m of foam/min. An effluent plant treating 25,000,000 gal/day of waste water from a 680 ton/day bleached kraft mill would require approximately 12 foam breakers. Capital cost would be $108,000. (Witt-IPC)
W77-10693

EXAMPLE OF PLANNING FOR ENVIRONMENTAL PROTECTION (PLANUNGSBEISPIEL ZUM UMWELTSCHUTZ).
Der Papiermacher, Vol 27, No 1, p 11-13, January 15, 1977. 1 fig.

Descriptors: *Pulp wastes, *Waste water treatment, *Planning, *Treatment facilities, Pulp and paper industry, Activated sludge, Water purification, Water pollution control, Biological treatment, Sewage treatment.
Identifiers: Board mills, Paper mills, Corrugating medium(Fluting paper), Waste paper.

After a brief introduction into the planning principles for effluent treatment installations, an example is presented of the planning of a treatment system for the effluent from a paper mill manufacturing corrugating medium on a waste-paper basis as well as for sewage. The system consists of two-stage activated sludge treatment with chemical-mechanical preclarification as well as intermediary and postclarification. (Speckhard-IPC)
W77-10694

APPARATUS FOR TREATING A LIQUID USING A PERCOLATING LAYER (APPAREIL DE TRAITMENT DE LIQUIDE A COUCHE DE PERCOLATION).
French Patent No 2,277,615. February 6, 1976. 11 p, 5 fig, 7 claims.

Descriptors: *Patents, *Pulp wastes, *Filters, *Waste water treatment, Filtration, Wastes, Industrial wastes, Pulp and paper industry, Water pollution treatment, Waste treatment, Water purification, Design.

Pulp and paper mill effluents and similar liquid wastes are treated by passing them through a layer of finely divided resin housed in a compartment formed by perforated partitions in a tower. In particular, the tower incorporates an infrastructure designed to alleviate problems related to periodic backwashing of the finely divided layer. (Speckhard-IPC)
W77-10696

DETERMINATION OF THE DEGREE OF ACCUMULATION OF RESIDUAL LIQUOR COMPONENTS DURING RECYCLING OF THE LIQUOR (OPREDELENIE STEPENI NAKOPLENIYA KOMPONENTOV POSLEDROZHZHEVOI BRAZHKI PRI VOZVRATE EE V PROIZVODSTVENNYI TSIKL),
For primary bibliographic entry see Field 3E.
W77-10697

ANALYSIS OF POLLUTANTS IN EFFLUENTS OF A PYROLYSIS FACTORY (ANALIZ ZAGRYAZNENII STOCHNYKH VOD PIROLIZNOGO PREDPIYATIYA),
For primary bibliographic entry see Field 5A.
W77-10698

CONTRIBUTION OF THE PULP AND PAPER INDUSTRY TO AGRICULTURE (TSELLYULOZNO-BUMAZHNAYA PROMYSHLENNOST' -- SEL'SKOMU KHOZYAISTVU),
Gosudarstvennaya Planovaya Komissiya, Moscow (USSR).
For primary bibliographic entry see Field 5E.
W77-10702

TOXICITY OF EFFLUENTS FROM THE PURIFICATION OF TALL OIL PRODUCTS AND CRUDE TURPENTINE FOR THE MICROFLORA OF TREATMENT FACILITIES (OPREDELENIE TOKSICHNOSTI STOCHNYKH VOD OT USTANOVOK PO OCHISTKE TALLOVYKH PRODUKTOR I SKIPIDARA-SYRTSA PO OTNOSHENIYU K MIKROFLORE OCHISTNYKH SOORUZHENII),
For primary bibliographic entry see Field 5C.
W77-10703

USE OF INORGANIC SORBENTS FOR THE PURIFICATION OF KRAFT MILL EFFLUENTS (PRIMENENIE NEORGANICHESKIKH SORBENTOV DLYA GRUBOKOI OCHISTKI VOD SUL'FAT-TSELLYULOZNOGO PROIZVODSTVA),
Leningradskii Tekhnologicheskii Institut Tsellyulozno-Bumazhnoi Promyshlennosti (USSR).
A. P. Dushina, A. A. Komissarenkov, A. V. Ukhtina, and S. V. Semenov.
Mezhvuzovskii Sbornik Statei Zakonchennykh Nauchnoe-Issledovanie Rabotakh, No. 4, p 90-92, 1976. 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Silica, *Gels, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Foreign countries, Sulfur compounds, Phenols, Organic compounds, Sorption, Effluents, Pulp and paper industry, Evaporators, Chemical oxygen demand.
Identifiers: Methanol, Kraft mills, USSR.

Copper-containing technical-grade silica gel preparations were used for the purification of evaporator condensate at the Kekhra kraft mill. The purification was conducted in a centrifugal apparatus containing 250 g of the sorbent. The sorbents used were KSK-Si, ShSK-Si, ASK-Si with a particle size of 2.7-7.0, 1.0-3.5, and 0.2-0.5 mm and a copper content of 1.20, 1.43, and 1.35 meq/g, respectively. Best results were obtained with the ASK-Si sorbent. This sorbent removed all sulfur compounds, 40% phenol, 21% methanol, and 52% organic substrates (a 52% reduction of COD). The sorbent could be easily regenerated by heating for 10 min at 200 C in a muffle furnace, and retained its sorption capacity after 5 regeneration cycles. (Stapinski-IPC)
W77-10709

GREAT LAKES PAPER (CO.) LAUNCHES FIRST CLOSED-CYCLE KRAFT PULP MILL.
Paper Trade Journal, Vol. 161, No. 6, p 29-34, March 15, 1977.

Descriptors: *Water conservation, *Pulp and paper industry, *Water pollution control, *Pulp wastes, Industrial wastes, Water pollution sources, Foreign countries, *Canada, Operating costs, Industrial water, Pollution abatement, Economics, Water pollution treatment, Water consumption, *Recycling, *Water reuse.
Identifiers: *Kraft mills, Closed systems, Chemical recovery.

A description is given of the new 700 ton/day bleached kraft pulp mill at Great Lakes Paper Co., Thunder Bay, Ontario. The closed-cycle process, variously referred to as the effluent-free process for the Rapson-Reeve process, consists essentially of recycling bleach plant effluents through the standard black liquor recovery cycle and, from the resulting white liquor, separating out the salt (NaCl) which becomes the basic raw material for the manufacture of chlorine dioxide. Flow sheets of the closed-cycle recovery system, salt recovery process, and pulp screening, cleaning, and bleaching operations are included. Benefits of the closed-cycle mill are reduced steam consumption, decreased fiber losses, increased pulp yield, lower consumption of bleach chemicals, reduced saltcake and defoamer use, elimination of external waste water treatment, and reduced water consumption. Mill odor is also reduced. Savings in operating costs for the closed-cycle mill are detailed. (Witt-IPC)
W77-10710

DISCUSSION OF THE RAPSON CONCEPT FOR A CLOSED-SYSTEM BLEACHED KRAFT PULP MILL (BESEDA O RAPSONOVE PROJEKTU UZAVRENE VYROBY BELENE SULFATOVE BUNICINY).
Papir a celuloza, Vol 31, No. 12, p 276, December, 1976.

Descriptors: *Water conservation, *Pulp and paper industry, *Water pollution control, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Foreign countries, Canada, Industrial water, Pollution abatement, Water pollution treatment, Effluents, Sodium chloride, Pulp and paper industry, *Recycling, *Water reuse.
Identifiers: *Kraft mills, Closed systems, Chemical recovery, Chlorine dioxide, White liquor(Kraft process).

During his visit in Czechoslovakia, Mr. W. H. Rapson discussed the Rapson-Reeve closed-cycle bleached kraft mill design, currently under construction by the Great Lakes Paper Co., Thunder Bay, Ontario. The process includes the application of chlorine dioxide in the first bleaching stage and a two-stage evaporation-crystallization of white liquor to remove NaCl introduced into the system by the countercurrent use of bleachery effluents in brown stock washing. The closed-loop arrangement should not result in the accumulation of inert chemicals in the system. The advantages of the closed circuit include the absence of effluents, higher pulp yield, and energy conservation. The concept is also applicable to sodium sulfite mills. (Trubacek-IPC)
W77-10711

DETERMINATION OF CONTAMINANTS IN KRAFT MILL CONDENSATES USING GAS CHROMATOGRAPHY (STANOVENI KONTAMINUJICICH LATEK V KONDENZATECH ZE SULFATOVE CELULOZKY POMOCI PLYNOVE CHROMATOGRAFIE),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
For primary bibliographic entry see Field 5A.
W77-10712

SEPARATION OF FIBERS FROM PAPER MILL EFFLUENT WITH CONTINUOUSLY BACKWASHED, PRESSURIZED, LIQUID FILTER,
New York State Dept. of Environmental Conservation, Syracuse.
E. V. Turkki, and N. L. Nemerow.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6-8, 1975, p 207-215. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. 3 fig, 3 ref, 1 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Waste water treatment, *Filters, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Separation techniques, Water purification, Filtration.
Identifiers: Tissue paper mills.

Pilot-scale studies of paper fiber separation from a tissue mill effluent by means of a continuously backwashing pressurized liquid filter are reported. The filter unit consists of a perforated metal container 10.5 inches (26.7 cm) long and 9 inches (22.9 cm) in diameter. The outer perimeter of the cylinder is covered with a filter cloth. The feedwater is introduced under pressure into the filter from the top of the outer casing and filters through the cloth leaving the fibers on the outside of the cloth. Two washer arms, operating inside the filter at 530 rpm, clean the filter continuously by forcing part of the filtrate back through the filter. The flow rate of the filter is 0.5-1.0 gal/min/sq ft (20.4-40.7 liters/min/sq m) with a fiber removal rate of 90%. The filtration capability of this unit is dependent on the selection of the filter cloth. The filter is competitive and has its place among those already used for suspended solids removal. (Witt-IPC)
W77-10713

REMOVAL OF HEAVY METAL IONS FROM WASTE SOLUTIONS BY CONTACT WITH AGRICULTURAL BYPRODUCTS,
Western Regional Research Lab., Berkeley, Calif.
J. M. Randall, and E. Hautala.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6-8, 1975, p 412-422. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. 8 fig, 13 ref, 6 tab.

Descriptors: *Bark, *Heavy metals, *Wood wastes, *Waste water treatment, Agriculture, Byproducts, Sorption, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Peanuts, Calcium carbonate, Lead, Iron, Metals, Separation techniques, Sodium sulfate, Flocculation, Chemical precipitation, Hardwood, Softwood.
Identifiers: Wood, Straw, Battery plant wastes, Walnut, Redwood, Western hemlock, Red oak, Douglas-fir, Sweetgum.

The authors discuss some of the experimental work carried out on the binding of heavy metal

ions, such as Pb, Cu, Hg, Cd, Zn, Ag, Co, Ni, Mg, Fe(II), Fe(III), and Mn to agricultural substrates (walnut meal, redwood, western hemlock, red oak, sweetgum, and Douglas-fir barks, peanut hulls, wood, and straw) and describe a demonstration project using calcium carbonate (flocculant), a Uniflow filter (closely woven tube of cotton, polypropylene, or other fiber, similar to a soaker hose, and closed at one end which has the capacity to pass water through its interstices while holding back particulate material), and a redwood bark column to remove lead and iron from the waste effluent of a lead battery plant. The bark column produced clean water for disposal to the sewer or for recycling. Sodium sulfate did not interfere with the removal of lead. (Witt-IPC)
W77-10714

RAW WASTE LOADING CHARACTERISTICS AND EFFLUENT QUALITY IN THE WET PROCESS HARDBOARD MANUFACTURING INDUSTRY,
Vanderbilt Univ., Nashville, Tenn. Center for Environmental Quality Management.
J. A. Roth, W. W. Eckenfelder, and J. A. Oleszkiewicz.
In: Proceedings of the 30th Industrial Waste Conference, Purdue University, May 6-8, 1975, p 540-547. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. 6 fig, 7 ref, 1 tab.

Descriptors: *Waste water(Pollution), *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Effluents, Biochemical oxygen demand, Biological treatment, Waste treatment, Water pollution treatment, Temperature, Operation and maintenance, Activated sludge.
Identifiers: *Hardboard mills.

After a brief description of the wet process for manufacturing hardboard, factors affecting the variability in the raw waste load (amount of pollutant discharged/unit of production/day) from hardboard mills are examined. Raw waste load variability is dependent on the fiber manufacturing process and type of wood used. Operational differences between wet-wet and wet-dry processes result in higher raw waste loads from the wet-dry process. BOD production is higher from the wet-dry than from the wet-wet process. Factors affecting the operation and performance of biological processes for treating hardboard mill wastes are discussed. It is shown that the biological processes are highly dependent on temperature. It is recommended that in northern areas a high-rate activated sludge treatment process with relatively short detention time be used to treat hardboard mill wastes. (Witt-IPC)
W77-10715

PURIFICATION OF PULP MILL EFFLUENTS BY THE ACTIVATED SLUDGE METHOD USING PURE OXYGEN (WYNIKI BADAN OCZYSZCZANIA SCIEKOW CELULOZOWYCH METODA OSADU CZYNNEGO Z UZYCIEM CZYSTEGO TLENU),
Technical Univ. of Warsaw (Poland). Instytut Zaopatrzenia w Wode i Budownictwa Wodnego.
M. Apolinarski, and M. Roman.
Przeglad Papierniczy, Vol. 33, No. 1, p 26-29, January, 1977. 3 fig, 12 ref, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Oxygen, Air, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Sedimentation, Dewatering, Foaming, Effluents, Foreign countries, Pulp and paper industry.
Identifiers: *Poland.

Results are presented of experiments conducted at the Ostroleka pulp and paper mill (Poland) in which raw kraft mill effluent was parallelly purified in two installations consisting of an activated sludge tank and a secondary sedimentation tank, one supplied with air, the other with pure oxygen. A comparison of the effectiveness of the two processes showed that the use of oxygen instead of air gives a higher reduction of 5-day BOD, COD, and oxidizability at the same purification time and similar pollution load. The activated sludge in the oxygen tank was more resistant to unfavorable fluctuations of the effluent properties. The amount of excess sludge was reduced 35%, and the excess sludge had better sedimentation and dewatering properties. There was also less foaming than in the system using air. (Stapinski-IPC)
W77-10716

ROTATING BIOLOGICAL DISC SYSTEM,
MacMillan Bloedel Research Ltd., Port Alberni (British Columbia).
Pulp and Paper Canada, Vol. 78, No. 4, p 66-72 (T86-T92), April, 1977. 6 fig, 13 ref, 7 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Bleaching wastes, Wastes, Industrial wastes, Pulp wastes, Water pollution treatment, Water pollution sources, Effluents, Color, Biochemical oxygen demand, Toxicity, Sludge, Hydrogen ion concentration, Temperature, Sodium compounds, Pulp and paper industry.
Identifiers: Sodium dithionite, Zinc dithionite, Groundwood, Thermomechanical pulps.

A laboratory evaluation of the secondary treatment of groundwood washer effluents from zinc and sodium dithionite bleaching processes was investigated, using a rotating biological disk (RBD) system. The tests performed were to determine the effectiveness of the RBD unit in removing effluent BOD and toxicity at various retention times. The effects on effluent color were also studied. Results indicated that the RBD treatment system is efficient in BOD removal for both Na and Zn dithionite effluents. For all cases, effluent color increased moderately after treatment. In addition, sludge characteristics and the effects of pH and temperature shocks were investigated for Na dithionite effluents. Preliminary investigations on thermomechanical pulping effluents were also conducted. (Brown-IPC)
W77-10717

PULP MILL CONDENSATES CLEANED BIOLOGICALLY WITH THE AID OF BARK (MASSAFABRIKERNAS KONDENSATVATTEN RENAS BIOLOGISKT MED HJALP AV BARK).
Engl. transl. avail. from Inst. of Paper Chem., Appleton, WI 54911, for $8.00. Svensk Papperstidning, Vol. 80, No. 3, p 78, February 25, 1977. 1 fig.

Descriptors: *Biological treatment, *Pulp wastes, *Bark, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Wood wastes, Filters, Nutrients, Bacteria, Sulfur compounds, Oxidation, Catalysts, Construction costs, Operating costs, Costs, Odor.
Identifiers: *Kraft mills.

A brief description is presented of the Enso-Biox process for treating kraft pulp mill condensates. The two-stage process is based on the use of specially treated waste bark as a filter medium, the bark also acting as a nutrient for a strain of bacteria catalyzing the oxidation of the sulfur compounds in the condensates to an innocuous form. Over 90% of the malodorous sulfur compounds are converted (hydrogen sulfide and methyl mercaptan up to 100%). Construction costs for the plant are competitive, and operating costs are low. (Speckhard-IPC)
W77-10719

METHOD FOR ELIMINATING ORGANIC AND INORGANIC BOUND NITROGEN FROM DOMESTIC AND INDUSTRIAL WASTE WATER,
Cellulose Attisholz A. G. (Switzerland). (Assignee).
M. Dubach, and A. Scherler.
U.S. Patent No. 4,011,156. March 8, 1977. 7 p, 1 fig, 31 claims.

Descriptors: *Waste water treatment, *Patents, *Denitrification, *Industrial wastes, *Domestic wastes, Waste treatment, Water pollution treatment, Water pollution sources, Aeration, Settling basins, Ammonification, Effluents.

A process for eliminating organic and inorganic bound nitrogen from domestic and industrial waste waters involves treatment in two aeration/settling stages. In particular, the ammonium-containing oxygen-free effluent coming from the settling tank of the first stage is aerated in the aeration container of the second stage under conditions favorable for extensive nitrification of the ammonium. A portion of the nitrified effluent from the settling tank of the second stage is continuously recirculated to the first stage, and is denitrified in the settling tank of the first stage, where conditions favorable for the ammonification of organic bound nitrogen and for denitrification of effluent are maintained. (Lynch-IPC)
W77-10721

SOME THEORETICAL AND PRACTICAL ASPECTS OF BIOLOGICAL PURIFICATION OF EFFLUENTS FROM SULFITE PULPING (EINIGE THEORETISCHE UND PRAKTISCHE ASPEKTE DER BIOLOGISCHEN SULFITZELLSTOFFABWASSERREINIGUNG),
VEB Filmfabrik, Wolfen (East Germany).
G. Otto, H. Schmidt, and G. Weigt.
Zellstoff und Papier, Vol. 26, No. 2, p 34-40, February, 1977. 1 fig, 6 illus, 26 ref, 3 tab.

Descriptors: *Pulp wastes, *Biological treatment, *Theoretical analysis, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Biochemical oxygen demand, Bleaching wastes, Pulp and paper industry, Effluents, Sulfite liquors, Sludge.
Identifiers: Sulfite pulp mills, Spent sulfite liquor.

A modern sulfite pulp and paper mill with 97% recovery of waste liquor solids can limit the BOD to 45-50 kg/ton of pulp, concentrated mainly in condensates and bleach plant effluents. At least 90% of this ca be eliminated by an intensified high-efficiency activated sludge process. The relation of rate of degradation to actual 5-day BOD (as described by the Michaelis-Menten equation for microheterogeneous enzymatic catalysis) has a correlation coefficient of only 0.78, and hence the kinetic constants so derived cannot be used for design purposes. The kinetic irregularities seem to depend, among other factors, on fluctuations in the composition of the biological population and the activity of the biomass. These fluctuations are probably also responsible for the varying oxygen consumption for acetic acid in the BOD determinations. A particularly critical form of change in the biological population is the formation of bulking sludge, which is illustrated by several examples. (Ward-IPC)
W77-10722

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART 2. DIFFERENT SEQUENCES FROM PREBLEACHING OF PINE AND BIRCH KRAFT PULP,
Swedish Forest Products Research Lab. Stockholm.
For primary bibliographic entry see Field 5A.
W77-10723

RETHINKING OUR APPROACH TO WATER SUPPLY PROVISION,
London School of Economics and Political Science (England).

For primary bibliographic entry see Field 6B.
W77-10746

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: TEXTILES INDUSTRY,
Little (Arthur D.), Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-10749

STUDIES ON COAGULATION TREATMENT OF SPENT WATER FROM PULPING PROCESS. (PART 3). COAGULATION MECHANISM OF LIGNIN (IN JAPANESE),
Tokyo Univ. (Japan).
M. Jo, G. Meshitsuka, and J. Nakano.
Japan Tappi, Vol 31, No 3, p 166-172, March, 1977. 10 fig, 18 ref.

Descriptors: *Pulp wastes, *Lignins, *Coagulation, *Waste water treatment, Aluminum, Hydrogen ion concentration, Flocculation, Chemical precipitation, Zeta potential, Electrophoresis, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents.
Identifiers: Aluminum sulfate.

When lignin in pulp mill effluents is treated with aluminum sulfate, the aluminum ion combines with the carboxylic and sulfonic acid groups of lignin. Following pH adjustment (with alkali), polynuclear aluminum complexes plus insoluble aluminum hydroxide are formed, and the lignin-aluminum complex flocculates and coagulates into larger flocs which ultimately precipitate. The zeta-potential of flocs measured via microelectrophoresis is generally considered to indicate the best coagulation pH. For lignin pollutants, however, the best pH for coagulation is not readily found via zeta-potential determinations, because the potential changes markedly with pH and relative lignin concentration. Lignin flocs formed by coagulation with excess alum show a minimum zeta-potential value at the best coagulation pH, whereas the zeta-potential of flocs normally obtained with small amounts of alum simply increases with increased pH. (See also W76-10839 and W75-07636) (Brown-IPC)
W77-10761

5E. Ultimate Disposal Of Wastes

DISINFECTION OF MUNICIPAL WASTE WATER WITH GAMMA RADIATION,
Johannesburg City Health Services (South Africa).
For primary bibliographic entry see Field 5D.
W77-10210

MASS BALANCE MONITORING OF LAND APPLICATION SITES FOR WASTEWATER RESIDUALS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10326

THE TREATMENT OF TOXIC EFFLUENTS: INVESTIGATIONS BY THE BCRA,
For primary bibliographic entry see Field 5D.
W77-10336

PROCESSING OF INDUSTRIAL WASTE FOR SOLAR EVAPORATION,
Pacific Disposal Systems, Inc., Martinez, Calif.
For primary bibliographic entry see Field 5D.
W77-10337

RECYCLING BISULFITE BRINES USED IN SWEET CHERRY PROCESSING,
Eastern Regional Research Center, Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W77-10341

OPERATING EXPERIENCES ON PETROCHEMICALS WASTE WATER TREATMENT PLANT OF GUJARAT AROMATICS PROJECT AT JAWAHARNAGAR,
Indian Petrochemicals Corp. Ltd. Jawaharnagar (India).
For primary bibliographic entry see Field 5D.
W77-10351

PREPARATION OF STAINED ALGINATE BEADS FOR PHOTOSENSITIZED OXIDATION OF ORGANIC POLLUTANTS,
Charles F. Kettering Research Lab., Yellow Springs, Ohio.
For primary bibliographic entry see Field 5D.
W77-10353

LET'S TALK RUBBISH; PART 2: RECYCLING SYMPOSIUM,
For primary bibliographic entry see Field 5D.
W77-10381

AN ANALYSIS OF CRITERIA FOR DETERMINING THE EXTENT OF PERMISSIBLE RADIOACTIVE WASTE DISPOSAL FROM NUCLEAR POWER STATIONS INTO RIVER SYSTEMS,
Hydrometeorological Service of the USSR, Moscow. Inst. of Applied Geophysics.
For primary bibliographic entry see Field 5C.
W77-10413

INFLUENCE OF DOMESTIC WASTES ON THE STRUCTURE AND ENERGETICS OF INTERTIDAL COMMUNITIES NEAR WILSON COVE, SAN CLEMENTE ISLAND,
California Univ., Irvine. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 5C.
W77-10512

DISPOSAL OF SALT WATER DURING WELL CONSTRUCTION, PROBLEMS AND SOLUTIONS,
Geological Survey, Miami, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-10519

PROTECTING GROUND WATER FROM DOMESTIC WASTEWATER EFFLUENT,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 5G.
W77-10520

TREATMENT OF EFFLUENTS: MODERN METHODS OF SEWAGE DISPOSAL,
University Coll. of Swansea (Wales). Dept. of Chemical Engineering.
J. A. Howell.
Oceans, No. 3, p 63-67, May, 1977.

Descriptors: *Water pollution control, *Waste disposal, *Outfalls, *Industrial wastes, *Municipal wastes, *Heavy metals, *Chemicals, Toxicity, Sludge disposal, Incineration, Biological treatment, Activated sludge, Chemical treatment, Flocculation, Waste water treatment.
Identifiers: UNOX, Wet air oxidation, Ocean dumping.

Various treatments of sewage effluents and disposal methods were described. Major emphasis was placed on disposal involving the oceans. It was noted that the use of outfalls for raw sewage disposal was based on the assumption that there was no danger of bacteriological contamination of beaches. Most recent considerations of the matter suggest that outfalls can be used for partially treated sewage which contains no visible identifiable floating material or toxic compounds. The outfall should extend at least a kilometer beyond the low water level, far enough to avoid shoreline contamination. Ocean disposal of sludge was also considered as a major problem. Biological and physicochemical treatment processes were described. The activated sludge, UNOX, and ICI deep-shaft processes were valued for their production of low sludge volumes which could be disposed by such methods as incineration. Physicochemical treatment was suggested for three types of pollutants: heavy metals, exotic new chemicals, and bulk industrial effluents. Other treatment processes included settling, sand filtration, coagulation, and flocculation of colloids by polymers or aluminum hydroxide. These processes can be followed by disposal through chemical decomposition, incineration, or wet air oxidation. (Collins-FIRL)
W77-10550

TRACE ELEMENTS IN WASTEWATER,
California Univ., Riverside. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-10577

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
E. B. Roberts, and R. M. Hagan.
California Agriculture, Vol 31, No 5, p 45, May, 1977.

Descriptors: *Water reuse, *Irrigation water, *Irrigation efficiency, *Energy, *Water costs, Irrigation practices, Waste disposal, Water sources, Water distribution, Waste water disposal, Waste water treatment, California.

The State Water Resources Control Board of California has evaluated energy costs for the reuse of waste water for agricultural purposes in comparison to costs for alternative importation of fresh water and ocean dumping of waste water. Since waste water discharged to the Pacific requires secondary treatment and outfall pumping, while waste water reused for irrigation of fodder, fiber, and seed crops requires only primary treatment, reuse instead of ocean disposal would save about 200 KWH in direct energy requirements. Reuse for pasture irrigation and surface irrigation of food crops also requires secondary treatment, therefore saving only approximately 50 KWH over ocean disposal. Waste water used for sprinkler irrigation requires additional coagulation and filtration, using slightly more energy (10 KWH/AF) than ocean disposal. Energy savings produced by reuse of waste water, however, are often offset by water quality and geographic considerations. When additional treatment processes are already indicated, as for a 'water quality limited stream segment', reuse of waste water for fodder, fiber, and seed crops becomes advantageous. (Schulz-FIRL)
W77-10579

MARYLAND RESEARCH FINDING GUIDELINES FOR SLUDGE USE.
Water and Wastes Engineering, Vol 14, No 6, p 42, June, 1977.

Descriptors: *Sludge disposal, *Trace elements, *Fertilizers, *Crop production, *Soil chemical properties, Soil contamination effects, Diseases, Solid wastes, Soil science, Grasses, Turf grasses, Municipal wastes, Waste water treatment, Food chains, Lawns, Path of pollutants.

Researchers at the University of Maryland have been investigating the use of sewage sludge as fertilizer for home lawns and food crops. Until now, widespread use of municipal sewage sludge as fertilizer has been hindered by the possibility that heavy metals and disease-causing organisms may infiltrate the food chain and adversely affect human populations. A prepared compost mix which is acceptable under federal guidelines for nonfood crops has been developed. An examination of the effects of sewage sludge application on crop yields, soil nutrient status, and soil structure has yielded favorable results. Soil temperature and pH affect the rate of uptake by plants of heavy metals. Elevated temperatures can increase the rate of uptake, but maintenance of pH conditions of about 6.5 can lessen uptake. Leafy vegetables absorbed heavy metals at a much higher rate than grasses or grass-type crops such as corn. Use of composted sludge on turf grass is suggested. (Schulz-FIRL)
W77-10580

SLUDGE DISPOSAL STRATEGY: PROCESSES AND COSTS,
Water Pollution Research Lab., Stevenage (England).
M. J. Burley, and R. W. Bayley.
Water PolluTion Control, Vol 76, p 205-215, 1977. 5 fig, 8 tab, 7 ref.

Descriptors: *Sludge disposal, *Costs, *Performance, Landfills, Oxidation lagoons, Incineration, Fertilizers, Heat treatment, Heavy metals, Waste water treatment, Pathogenic bacteria, Anaerobic digestion.

The minimization of sludge treatment and disposal costs was investigated. Disposal strategies included ocean dumping, landfilling, liquid disposal in lagoons, spreading on agricultural lands, and use as fertilizers. Incineration was considered as a form of treatment. Heavy metal and pathogen content must be considered in any choice. Options available for treatment to avoid risk of infection included: anaerobic digestion, heat treatment, and lagoons. Land application of untreated sludges was not generally accepted, but has sometimes been used without ill effects. Specific risks need to be further investigated. Capital and operating cost comparisons indicated that lagoon treatment with decanting could produce substantial savings. A procedure was presented for selecting appropriate methods of treatment. (Collins-FIRL)
W77-10609

SLUDGE PASTEURIZATION BY HEAT AND IONIZING RADIATION. RESULTS OF A STUDY FOR THE EFFLUENTS PURIFICATION PLANT, BERN-NEUBRUECK (SCHLAMMHYGIENISIERUNG DURCH WAERME UND IONISIERENDE STRAHLEN: ERGEBNISSE EINER VERFAHRENSSTUDIE FUER DIE ARA BERN-NEUBRUECK),
For primary bibliographic entry see Field 5D.
W77-10615

ALUM SLUDGE DISPOSAL - PROBLEMS AND SUCCESS,
East Bay Municipal Utility District, Oakland, Calif.
H. L. Nielsen.
American Water Works Association Journal, Vol. 69, No. 6, p 335-341, June, 1977. 1 fig, 6 tab.

Descriptors: *Treatment facilities, *Sludge treatment, *Water pollution control, Water purification, Dewatering, Waste disposal, Polymers, Turbidity, Color, Odor, Performance, Equipment, Waste water treatment.
Identifiers: Alum sludges.

Government regulations on the discharge of pollutants were the basis of the investigation of alum disposal at two California treatment plants. One plant discharged effluents into a creek which had negligible natural flow during the summer. Creek waters were discolored and a fan-shaped area of turbid water extended into the San Francisco Bay. A minimum year-round flow was needed to eliminate odor problems caused by stagnant waters. Three options were considered after the plant was ordered to meet creek-discharge standards. One was ponding sludges on site with sludge thickening, air evaporation, and offhaul of dried sludge. The second involved ponding, thickening and pumping to watershed lands for final ponding, and air-drying. Maximum sludge dewatering and truck offhaul was the last alternative. The latter was the most economical solution. The process consisted of wash-water-settling basins, sludge clarifiers, a reclaim pumping plant to recycle reclaimed water to raw water line, and a dewatering chamber with scroll centrifuges. Clarifier overflow discharged to the creek provided the flow needed to reduce odor problems. The second plant's discharge effects were similar, but less severe. A reclamation facility was constructed to include wash-water-settling basins, a reclaimed water and sludge transfer pumping plant, and a continuous belt-type dewatering unit. Supernatant was recycled to the raw water system after pressure filtration. Sludge, with polymer added, was passed to the dewatering unit. The process produced minimal turbidity in the filter-plant raw water. A sludge with the necessary solids content for continuous dewatering was produced. (Collins-FIRL)
W77-10616

MIAMI PLANS INJECTION WELL FOR WASTEWATER DISPOSAL.
Water and Wastes Engineering, Vol. 14, No. 6, p 70, June, 1977. 1 fig.

Descriptors: *Saline water-freshwater interfaces, *Saline water intrusion, *Injection, *Injection wells, *Underground waste disposal, Waste water disposal, Municipal wastes, Aquifers, Aquitards, Environmental engineering, Waste water treatment.
Identifiers: Miami(FL).

A pilot study is being conducted by the Miami-Dade Water and Sewer Authority to determine design criteria for a deep well injection system for disposal of treated waste water. The target injection zone for the test well is a highly permeable dolomite zone which is overlain by approximately 1000 feet of dense carbonates, protecting the Floridan aquifer from contamination by waste water. Geophysical logging and drilling data will be used to determine optimum depths for the steel casings surrounding the test well. (Schulz-FIRL)
W77-10619

IRRIGATION TRIAL WITH MORRO BAY WASTEWATER,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10623

IRRIGATING WITH WASTEWATER IN SONOMA COUNTY,
California Univ., Davis. Cooperative Extension.
For primary bibliographic entry see Field 5D.
W77-10624

COMBINED PROCESSING OF WASTEWATER AND SOLID WASTE,
Brown and Caldwell, Walnut Creek, Calif.
For primary bibliographic entry see Field 5D.
W77-10625

WATER TREATMENT PLANT SLUDGES: AN UPDATE OF THE STATE-OF-THE-ART,
For primary bibliographic entry see Field 5D.
W77-10634

A METHODOLOGY FOR ASSESSING LAND APPLICATION OF SLUDGES AND WASTEWATERS,
S. Chatterjee.
Proceedings - Institute of Environmental Sciences, p 107-113, 1977. 5 tab, 14 ref.

Descriptors: *Waste disposal, *Evaluation, *Sludge disposal, *Irrigation, Environmental control, Soil properties, Analytical techniques, Water table, Physical properties, Flooding, Waste water treatment.
Identifiers: Application on Land Assessment System(ALAS), Miami(OH) Valley Region.

The Application on Land Assessment System (ALAS) was presented for the assessment of environmental impact of sludge and waste water land application. Land application of these substances has become one of the most useful methods for meeting elimination or reduction goals for pollutant discharges. The ALAS method involves five steps. The suitability of the sludge/waste water is first established. Application rate criteria and land suitability are then determined. The appropriate environmental parameters are identified and map areas classified. The collected data are then analyzed. Sludge application parameters include land slopes, soil permeability and pH, flood frequency, and proximity to water sources. Other factors include: depth to bedrock, perched, or permanent water tables; proximity to surface water; and ponding. The most important parameters for waste water irrigation are drainage and soil types. The parameters for sludge application also apply to waste water applications. The approach consists of identifying magnitudes of various environmental parameters and relating them to various degrees of potentially adverse impacts. A simplified interaction analysis is the basis of this method. A study of the Miami Valley (Ohio) region was conducted with this method. Additional refinements may make ALAS an effective implementation tool. (Collins-FIRL)
W77-10635

SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5D.
W77-10647

CURRENT TRENDS IN WATER RECLAMATION TECHNOLOGY,
Los Angeles County Sanitation Districts, Whittier, Calif.
For primary bibliographic entry see Field 5D.
W77-10649

CONTRIBUTION OF THE PULP AND PAPER INDUSTRY TO AGRICULTURE (TSELLYULOZNO-BUMAZHNAYA PROMYSHLENNOST' -- SEL'SKOMU KHOZYAISTVU),
Gosudarstvennaya Planovaya Komissiya, Moscow (USSR).
V. I. Kropotov.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 8, p 26-27, 1976. 1 fig, 1 tab.

Descriptors: *Yeasts, *Pulp wastes, *Byproducts, *Fermentation, Wastes, Industrial wastes, Water pollution sources, Proteins, Pulp and paper industry, Wood wastes, Water pollution control.
Identifiers: Ethanol, *USSR.

Statistical data are presented showing the production of feed yeast at pulp and paper mills in the USSR. This production has been increasing steadily from about 10,000 tons in 1961 to nearly 140,000 tons in 1975. The estimated production in 1980 should be 158,000 tons. At 27 mills, yeasts are produced from spent sulfite liquor, at two mills (Bratsk and Baikal complexes) from prehydrolyzates, and at two mills which have

hydrolysis plants (Segezha and Syktyvkar) from wood hydrolyzates. The construction of hydrolysis plants at other mills is planned for the near future. These plants will utilize wood waste. A table is given showing, for 1975, the production of pulp and of yeast, the yields of yeast per ton of pulp, and the protein content of yeast at mills that produce both ethanol and feed yeast from spent sulfite liquor, at mills that produce only yeast, and at mills that produce yeast from prehydrolyzates and hydrolyzates. (Stapinski-IPC)
W77-10702

5F. Water Treatment and Quality Alteration

NOTE ON THE TRACE METAL CONTENT OF MEMBRANE FILTERS,
National Physical Research Lab., Pretoria (South Africa). Applied Spectroscopy Div.
H. R. Watling, and R. J. Watling.
Applied Spectroscopy Division. Pretoria, South Africa, Water SA., Vol 1, No 1, p 28-29, April 1975. 1 tab, 2 ref.

Descriptors: *Filters, Trace elements, Analytical techniques, Metals, *Filtration, *Water treatment.
Identifiers: South Africa, *Ultrafilters, *Membrane filters.

The preliminary preparation of natural water samples for trace metal analysis frequently includes a filtration step to remove the 'insoluble' particulate fraction. The particulate fraction plus filter are then dissolved in order to determine the trace element content of the 'insoluble' phase. Trace metals in the filters may contaminate samples during filtration and may also contribute significantly to the trace element content of the particulate fraction. The object of this study is to determine not only the trace element content of these filters, but also the metal content variation between filters, in order to select that filter which might be expected to least contaminate the samples. The results obtained are not very encouraging. However, the following points may be made: When only a few selected elements are to be analysed it may be possible to select a filter containing low concentrations of these metals. It is advisable to chose that filter with the least coefficient of variation (percent) in trace metal levels in order to determine a useful background level for a large number of elements. (So African Water Info Center)
W77-10383

MAKING WATER SUPPLY NITRATE REMOVAL PRACTICABLE,
Garden City Park Water District, N.Y.
M. Sheinker, and J. P. Codoluto.
Public Works, Vol 108, No 6, p 71-73, June, 1977. 1 fig.

Descriptors: *Groundwater, *Nitrates, *Denitrification, *Ion exchange, *Water supply, *Water treatment, Resins, Pumping, *New York.
Identifiers: *Garden City Park(NY).

Although removal of nitrates from water has been within the reach of water works technology for quite some time, economic feasibility has been a continual problem. Faced with the dilemma of either abandoning a $300,000 well installation which began producing unacceptable nitrate concentrations or removing the nitrates from the well water, the Garden City Park Water District (Nassau County, New York) opted for the latter. A continuous concurrent ion exchange system was proposed, evaluated, and installed. Alternating between cyclical 'run' and 'pulse' modes, the system first passes raw well water over a synthetic resin exchange medium where denitrification takes place. A regeneration process then strips nitrates from the contacted resin while 'fresh' resin is moed into the exchange area, after which the cycle begins again. Liquid caustic is also added to the system to adjust the somewhat acidic well water to an acceptable pH; disinfection with liquid chlorine is practiced when deemed necessary. Overall, the system has proved effective and dependable, and may perhaps serve as a model for other water supply systems with excessive nitrate problems. (Eberle-NWWA)
W77-10525

DEMONSTRATION OF VOID SPACE STORAGE WITH TREATMENT AND FLOW REGULATION.
1976. 114 p, 30 fig, 11 tab, 22 ref, 4 append. EPA Technical Report EPA-600/2-76-272.

Descriptors: *Combined sewers, *Overflows, *Storage, Design, Performance, Operation, Construction, Treatment facilities, Storm water, Costs, Economics, Water pollution control, Waste water treatment, Flow control.
Identifiers: Void space storage.

Void space storage was presented as a means of regulation and containment for combined sewer overflows. The result was a reduction of pollution loads discharged to receiving streams. A two-year study considered system design, construction, and performance. The prototype system was built in Akron, Ohio. A combined sewer drainage area of 188.5 acres was provided. A one million gallon void space retention tank received excess flows. The excavated tank was lined with an impermeable membrane and filled with inert matter. The waste water was stored in the void space of the media. After the storm, stored water was gravity fed into interceptor sewers for further treatment. The facility's top could be used as a park or recreational grounds. Other functions of the tank include chlorination. The project cost $750,000 and projected costs for other facilities were $0.30 to $0.35 per gallon. No detectable fould odors or flammable gases were produced during the study period. Slime and algal growth in the media were non-existent and there was no evidence of rodent or insect infestations. The facility was not operated in an automatic mode. Some design changes were recommended, but the concept could provide a practical and economical solution to pollution problems associated with combined sewer overflows. (Collins-FIRL)
W77-10532

HIGH SERVICE WATER PUMPING STATION,
Wichita Water Dept., Kans.
J. A. Veon.
Public Works, Vol. 104, No. 3, p 94-95, March, 1973. 3 fig.

Descriptors: *Pumping, *Water distribution(Applied), Kansas, Utilities, Centrifugal pumps, Electric motors, Municipal water, Electric power, Pumping plants.
Identifiers: Wichita(Kansas), Pumping station.

A new high service pumping station for the municipally owned water utility of Wichita, Kansas has been designed by consulting engineers Black and Veatch, Inc. of Kansas City, Missouri to replace an 84-year old station now in use. The new facility will not only improve pumping operations, but will also improve the efficiency of the total water system and strengthen the foundation upon which other improvements will be planned and built in the future. Of the many work saving and reliability features designed into the new station, the auxiliary power system to supply energy to seven electrically driven pumps during periods of emergency is the most unusual. The primary source of power for conventional pumping will be two separate generating stations providing service through two 69 kv overhead transmission lines, one of which runs adjacent to and the other directly over the new pumping station site. An underground cable between the high service pumping station and the main cranking diesel generator at the electric company's central powerplant will be constructed for use in the event of a total blackout. Other improvements and refinements designed into the new pumping station include division of the facility into four independent cells to prevent flooding in case of a pipe leak. The centrifugal pumps to be installed will be of the bottom suction, side discharge type connected through a coupling to, and driven by, a constant speed synchronous electric motor. Above the operating floor, the station will have walkways around the top of each of the separate pump rooms. A crane will provide direct access to all pumping units through large open portions in the floor. Hatches and removable slabs will be provided to allow removal of valves and other equipment. Minimum facilities will be provided for maintenance and occasional manual operation of the station. (Sandoski-FIRL)
W77-10545

DIRECT DIGITAL CONTROL AT THE IOWA CITY WATER-TREATMENT PLANT,
EMA, Inc., St. Paul, Minn.
A. W. Manning.
American Water Works Association Journal, Vol. 69, No. 6, p 317-324, June, 1977. 10 fig.

Descriptors: *Computers, *Digital computers, *Municipal water, *Water quality control, Automatic control, Filtration, Costs, Waste water treatment, Data storage and retrieval, Pumps, Effluents.
Identifiers: Iowa City(IA).

A report was presented on computer control of the water treatment plant in Iowa City, Iowa. Because of plant expansion and the variability of conditions in the Iowa River, a digital system was chosen over the more expensive and complex analog system. Although the plant was designed to be run automatically, an operator could assume control of plant operations at any of five control panels, and could run the plant by computer or manually. Processes discussed included: skimming-gate control, low-lift-pump sequencing, flow split, sludge-blanket control, filter control and washing, chemical feed control, clear-well control, distribution, and high service control. Computerization of low-lift-pump sequencing saved on power, due to programming for minimum horsepower, and on equipment wear, due to more efficient and less frequent starts and stops. Filters could be washed automatically, thus increasing effluent quality. The devices were constantly monitored; an alarm would sound and be printed out if any device was operating in alarm condition, and must be acknowledged and shut off by the operator. A digital system provided data-handling capabilities which would be unavailable with an analog system. Data were supplied and managed by an operator control panel, a graphic panel, an alarm logger, and a report logger. Logs could be made up continuously and at any set time interval daily, monthly, and yearly. The digital control system proved to have increased quality of effluent and efficiency of operation; lowered costs in power and chemicals; and improved control of distribution. (Diggs-FIRL)
W77-10585

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5D.
W77-10591

SOLVINC STREAM POLLUTION CONTROL PROBLEMS WITH DIGITAL COMPUTER AND MODELLING TECHNIQUES,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-10596

BRAZIL--A MARKET FOR BRITISH EFFLUENT AND WATER TREATMENT PLANT MANUFACTURERS,
For primary bibliographic entry see Field 5D.
W77-10603

POLYMERS ARE PRECISELY MANAGED,
Cleveland Regional Sewer District, Ohio.
For primary bibliographic entry see Field 5D.
W77-10620

CONTAMINATION OF DRINKING WATER BY CORROSION OF COPPER TUBES,
Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-10735

WATER POLLUTION AND HUMAN HEALTH,
Ohio Univ., Athens. Dept. of Economics.
For primary bibliographic entry see Field 5C.
W77-10751

5G. Water Quality Control

EFFECT OF WIND AND RAIN ON SURFACE REAERATION,
Universidad Nacional Autonoma de Mexico Inst. of Engineering.
For primary bibliographic entry see Field 2H.
W77-10115

MODELING THE PERFORMANCE OF FEEDLOT-RUNOFF-CONTROL FACILITIES,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-10157

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 677, Price codes: A05 in paper copy, A01 in microfiche. March 20-21, 1975. Special Publication 37, IIEQ Document No. 75-16, August, 1975. 87 p., 9 fig., 5 tab., 59 ref. Edited by W. D. Seitz. OWRT A-999-ILL(4).

Descriptors: *Federal Water Pollution Control Act, Waste water treatment, *Water quality standards, Water quality, Social aspects, Legal aspects, Legislation, Water pollution sources, Pesticides, Nutrients, Land use, Leachate, Dissolved solids, Suspended solids, Erosion, Sedimentation, Mining construction, Agriculture.
Identifiers: *Non-point source pollution, *FWPCA 1972 Amendments.

Participants representing various state, federal, industrial, academic and citizen-action organizations met for a workshop to study and discuss the many ramifications of water pollution from diffuse sources. Discussion was aimed at providing participants with an overview of the subject focused on both the technical and federal legislative perspectives of non-point source water pollution. Problems and policy alternatives were discussed for agriculture, mining, urban areas and the constructive industry. Interest group presentations were made by the Illinois Municipal League, Illinois Agricultural Association, Midwest Coal Producers Institute, Association of Soil and Water Conservation Districts, Association of General Contractors, and Illinois League of Women Voters. Small group workshops covered agriculture, urban areas, mining, construction, water quality, public participation, expected problems, future research and policy development. Current research activities were described by the Illinois Natural History Survey, the Erosion-Sedimentation Task Group, Pesticides, Task Group, Plant Nutrients Task Group, EPA, Illinois State Water Survey, Illinois State Geological Survey, and Northern Illinois University's Department of Geology. (See W77-10160 thru W77-10164). (Harris-Wisconsin).
W77-10159

PROBLEMS AND POLICY ALTERNATIVES: URBAN AREAS,
Envirex, Milwaukee, Wis.
T. L. Meinholz, C. A. Hanson, and W. J. Katz.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 20-24. 5 fig, 8 ref.

Descriptors: *Water pollution sources, *Storm water, *Storm runoff, *Urban runoff, Wisconsin, Sewage effluents, Sewerage, Waste water treatment, Sewers, Cities, Urban areas, Technology.
Identifiers: *Non-point source pollution.

Storm-generated flows and runoff, sewer overflows, and other aspects of urban non-point water pollution are discussed, using examples from case histories at Kenosha and Racine, Wisconsin. Stormwater often contains high fecal coliform counts (up to 76,000/100ml). Separation of sanitary sewage from stormwater does not necessarily provide a solution to the problem of stormwater disposal. Moreover, sewers are usually combined in a single system in the central city where all the land is totally developed. Reference is made to an investigation of combined sewage characteristics made of discharges in 15 cities, with data given for BOD values, COD, suspended solids, nitrogen, phosphorus, and coliform counts. Before further technology and dollars are expended in the areas of advanced and tertiary treatment of municipal wastewaters for the betterment of water quality, an in-depth analysis of the health hazards and water quality degradation resulting from the continued discharge of untreated stormwater should be performed. Areas of further development include better drainage area housekeeping practices such as street cleaning, construction site runoff control and prudent application of chemicals to land, as well as improvements in conveyance systems and the treatment of discharges emanating from these systems. (See also W77-10159) (Harris-Wisconsin)
W77-10160

PROBLEMS AND POLICY ALTERNATIVES: AGRICULTURE,
Illinois Univ. at Urbana-Champaign. Dept. of Agricultural Economics.
E. R. Swansonn.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 14-19. 21 ref.

Descriptors: *Water quality standards, *Water pollution sources, *Agriculture, *Agricultural runoff, Sediments, Erosion, Pollution abatement, Costs, Law enforcement, Monitoring, Erosion control, Fertilizers, Nitrogen compounds, Economic impact.
Identifiers: *Effluent limitations, *Non-point source pollution.

Agricultural sources of potential non-point surface and ground water pollution are considered, including sedimentation, plant nutrients, animal wastes and pesticides. It is estimated that 85% of soil erosion occurs on cropland, and cropland provides half the sediment entering inland waterways. Precise contributions of fertilizer use to surface and ground water is accumulating. Information needed for public policy formulation about agricultural non-point source pollution are: (1) Costs to the firm of adjustments to production related to reduction of potential pollutants; (2) Physical relationships between levels of on-farm pollutant generation and the various parameters of water quality at the locations of interest; (3) The functional relationship between these parameters and damage to the environment, including human health; (4) Responses of individuals in the system; (5) Policy implementation costs such as those for information programs, tax or subsidy administration, enforcement, monitoring to determine effectiveness, and litigation. Alternative policies for control of non-point source agricultural water pollution are also discussed, along with analyses of the economic impact of the erosion-sedimentation and nitrogen fertilizer problems. (See also W77-10159) (Harris-Wisconsin)
W77-10161

THE TECHNICAL PERSPECTIVE (WHAT IS QUALITY WATER),
Texas Univ., Austin. Dept. of Environmental Engineering.
G. A. Rohlich.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 5-9. 11 ref.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Water pollution sources, *Technology, Analytical techniques.
Identifiers: *Non-point source pollution, *FWPCA 1972 Amendments, Effluent limitations.

Technological aspects of water pollution control are discussed, including a brief review of the highlights of historical water quality development from the British Chadwick Report (1842) to the Federal Water Pollution Control Act Amendments (FWPCAA) of 1972. A comprehensive approach is needed in which the total environment affected by water quality is considered, comprising public health, standards of quality, biological effects and aesthetics. A conceptual framework is presented in which water quality standards called for in FWPCAA are developed: (1) criteria based on scientific determinations as to qualities of a resource that must be identified are set up for specific use in water resource systems; (2) identification of water quality characteristics is made through analytical methods of chemistry, biology, engineering and other disciplines; (3) measuring instruments are deployed to monitor criteria and water quality information for assessment and control; (4) standards are then defined through the first three steps as acceptable quality related to unique local situational factors. Especially in comparing non-point water pollution sources to point sources, water quality standards must be kept flexible and should be tailored to specific applications. (See also W77-10159) (Harris-Wisconsin)
W77-10162

PROBLEMS AND POLICY ALTERNATIVES: MINING,
Environmental Protection Agency, Springfield, Ill.
R. L. Schleuger.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 20-24.

Descriptors: *Water quality standards, *Water pollution sources, *Illinois, *Coal mines, *Coal mine wastes, Mine acids, Pyrite, Sulfur compounds, Water pollution control, Decision making, Land reclamation.

The operational characteristics of mining are considered in relation to non-point source water pollution, especially in Illinois coal mining, where an

estimated 400 miles of streams and rivers are affected by mine drainage. Of this, 265 stream miles in southern Illinois are affected to such a degree that they are either void of fish and aquatic life or will not support them. Polluting mine wastes include refuse piles, slurry lagoons and polluting chemicals such as iron, manganese, aluminum and sulfates of calcium and magnesium. Mining-related water pollution in Illinois comes predominantly from surface drainage over and percolation through mine refuse heaps and from drainage over the massive areas of spoil banks and exposed mineral seams. Coal mine refuse piles pose a particular threat of water pollution because they contain iron sulfide (pyrite) which upon oxidation and contact with water can produce drainage containing sulfuric acid and iron. Such oxidation can produce 198 lbs. of acidity per acre of refuse per day. Most of the contaminants come from about 1,600 abandoned mines in 69 Illinois counties. Possible effects of coal-gasification plans on water quality also need to be considered. Overall goals and objectives of a coal mine wastes program in Illinois are reviewed. (See also W77-10159) (Harris-Wisconsin)
W77-10163

PROBLEMS AND POLICY ALTERNATIVES: CONSTRUCTION,
Hittman Associates, Inc., Columbia, Md.
T. R. Mills, and H. T. Hopkins.
In: Proceedings: Workshop on Non-Point Sources of Water Pollution, March 20-21, 1975, Illinois Univ. at Urbana-Champaign, Agricultural Experiment Station and Illinois Institute for Environmental Quality, p 35-43. 11 ref.

Descriptors: *Water pollution sources, *Construction, Land use, Planning, Sediment control, Erosion control, Soil stabilization, Runoff, Storm water, Water pollution control, Regulation.
Identifiers: *Non-point source pollution.

Non-source water pollution problems attendant on increases in American construction activity are reviewed, along with discussion of some of the technological and institutional aspects of controlling it. Water pollution from construction is described as sediment, chemical pollutants and biological pollutants. Each calls for a separate kind of control program. A comprehensive plan for water pollution abatement emphasizes two interrelated approaches: (1) control of non-point source water pollution from construction by overall land use planning; (2) control of water pollution at the construction sites themselves. Sediment control can be achieved through technology applied to control of erosion, sediment containment and stormwater management. The first two kinds of controls are concerned with controlling sediment at its source, the third with preventing generation of sediment downstream and outside the bounds of the construction site. Control of pollutants other than sediment generally involves abatement of such trace elements as lead, chromium, cobalt and manganese from concrete wash-water operations. Also discussed are institutional considerations involving various state and federal control rules, and education at the sub-professional level in the construction industry. (See also W77-10159) (Harris-Wisconsin)
W77-10164

STREAM COMMUNITY RESPONSE TO ROAD CONSTRUCTION SEDIMENTS,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
For primary bibliographic entry see Field 4C.
W77-10182

OPTIMAL SYSTEMS OF STORM WATER DETENTION BASINS IN URBAN AREAS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 4D.
W77-10184

SIMULATION OF THE SEDIMENTOLOGY OF SEDIMENT DETENTION BASINS,
Kentucky Water Resources Research Inst., Lexington.
A. J. Ward, C. T. Haan, and B. J. Barfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 611, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 103, June 1977. 133 p, 30 fig, 6 tab, 77 ref. OWRT B-046-KY(1), 14-34-0001-6081.

Descriptors: *Detention reservoirs, Sediments, Urban hydrology, *Simulation analysis, Sedimentology, *Water pollution control, *Model studies, *Sediment transport, *Settling basins.
Identifiers: *Sediment detention basins.

Sediment detention basins are a widely used means of controlling downstream sediment pollution resulting from stripmining and construction activities. A mathematical model for describing the sedimentation characteristics of detention basins has been developed. This model requires as inputs the inflow hydrograph, inflow sediment graph, sediment particle size distribution, detention basin stage-area relationship and detention basin stage-discharge relationship. Based on this information the model routes the water amd sediment through the basin. In this routing process the outflow sediment concentration graph, the pattern of sediment deposition in the basin and the sediment trapping efficiency are estimated. Comparison of predicted results with measured sediment basin performance indicates the model accurately represents the sedimentation process in detention basins. This report presents details of the model, illustrates its use in design, explains how to process the model on a digital computer and presents a program listing of the model. (Huffsey-Kentucky)
W77-10185

FORECASTING: THE CHALLENGE TO THE AQUATIC SCIENCES,
Michigan Univ., Ann Arbor. Dept. of Natural Resources; and Michigan Univ., Ann Arbor. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W77-10190

HEAVY METAL ENRICHMENT IN MINE DRAINAGE: I. THE RUSTENBURG PLATINUM MINING AREA,
Pretoria Univ. (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-10199

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland).
R. Helmer.
Public Health, Vol. 76, No. 6, p 159-171, June 1976.

Descriptors: Water supply, *Water pollution control, Public health, Water quality control, Water resources, Management, Water quality standards, Water reuse, Environmental effects, Regional development.
Identifiers: *World Health Organization.

The World Health Organization (WHO) has since its inception been very active in the field of water pollution control and has continually assisted Member States in evaluating need and developing programs in this field. Problems involved and the types of technical assistance provided by WHO are described. Public health aspects of water pollution, sources and types of pollutants, and the problems related to different uses of water are discussed. A summary is made of water quality criteria and standards, the monitoring of water quality, and control action for preventing or reducing water pollution. (So African Water Info Center)
W77-10201

MALACOLOGICAL STUDIES IN THE LUFIRA (KATANGA) ARTIFICIAL LAKE AREA: DISTRIBUTION AND ECOLOGY OF AQUATIC MOLLUSCS: EPIDEMIOLOGICAL ROLE OF INTESTINAL AND URINARY BILHARZIOSIS VECTORS, (IN DANISH),
For primary bibliographic entry see Field 5C.
W77-10238

STUDIES ON THE NATURAL RELATIONSHIPS OF CYANOPHAGES AND THEIR HOSTS AND THE NATURE OF RESISTANCE,
Livingston Coll., New Brunswick, N. J. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-10266

CONTROL OF ALGAE IN LAKES, LAGOONS AND SMALL RESERVOIRS WITH BIOGROWTH PARTITIONS,
Missouri Univ.-Rolla. Dept. of Civil Engineering.
B. G. Wixson, and D. E. Modesitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 775, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 1977. 41 p, 15 fig, 5 tab, 28 ref. OWRT A-077-MO(2), 14-34-0001-5025 and 6026.

Descriptors: Suspended solids, Growth rates, *Biological treatment, *Algae, Lagoons, Reservoirs, Model studies, *Algal control, Lakes, *Oxidation lagoons, Design, *Eutrophication, Water pollution effects, Chemical oxygen demand, Dissolved oxygen, Carbon dioxide, Waste water treatment.
Identifiers: *Biogrowth partitions(Lagoons).

Research was carried out on the control of algae from small lagoons through laboratory and field studies of manmade biogrowth surfaces for removing or controlling algae. Three lab-scale stabilization lagoons were modified with the addition of biogrowth sheets and operated with 30-day and 15-day detention period. Principal parameters measured were COD, Suspended Solids (SS), Dissolved Oxygen (DO), pH, Carbon Dioxide, (CO2), and microbial populations. Experimental laboratory results indicated that the application of biogrowth sheets was effective for lagoon stabilization. The practicability and design characteristics of the lagoon modification were then evaluated in field investigations. Algal growths on the biogrowth panels were helpful in the control of algae. Problems were encountered with solids not reaching an equilibrium which was attributed to the use of a batch method. Tanks using the biogrowth partitions produced a low Biochemical Oxygen Demand (BOD) but experienced problems with the use of raw sewage as a feed. The efficiency of treatment by biogrowth panels, however, was not deemed to be of a significant increase over the traditional lagooning method.
W77-10268

EXPERIMENTAL STUDIES ON CHANGING ALGAL POPULATIONS FROM BLUE-GREENS TO GREENS,
Minnesota Univ., Minneapolis. Limnological Research Center.
J. Shapiro, G. Zoto, and V. Lamarra.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 779, Price codes: A03 in paper copy, A01 in microfiche. Contribution No. 168, June 1977. 27 p, 4 fig, 3 tab, 5 ref. OWRT B-087-MINN(1), 14-31-0001-4096.

Descriptors: Lakes, Algae circulation(Water), *Cyanophyta, *Chlorophyta, *Minnesota, Food chains, Food levels, Water pollution control.
Identifiers: *Lake restoration, *Lake Emily(Minn), Artificial circulation(Lakes).

This research involves shifting of algal populations for possible lake restoration work. The site was Lake Emily, a small, shallow lake north of St. Paul, Minnesota. The research supports the notion that as phosphate becomes available, those algae that are able to outcompete others for it will become predominant. The work may have great value in Lake restoration. It may be possible to manipulate small or moderate sized lakes to improve them. Part of the manipulation may involve converting the population of algae from forms inedible by zooplankton to forms that can be eaten by them. It may be possible to bring about a blue-green to green shift in algal populations in whole lakes. Continuing studies indicate that the same factors operating to cause the shifts are responsible for shifts brought about by artifical circulation. (Waelti-Minnesota)
W77-10269

A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL: AN ASSESSMENT,
Resources for the Future, Inc., Washington, D. C.
C. S. Russell, and W. O. Spofford, Jr.
Journal of Environmental Economics and Management, Vol. 4, No. 2, p 89-110, June 1977. 3 fig, 6 tab, 23 ref.

Descriptors: *Environmental control, *Water quality, *Management, *Alternative planning, *Costs, *Linear programming, Regional analysis, Standards, Air pollution, Delaware River, Optimization, Constraints, Feasibility, Industries, Ecosystems, Mathematical models, Systems analysis.
Identifiers: Cost minimization, Residuals management, Distributional information.

A discussion is presented of the research and policy lessons learned from a large environmental quaity management model contructred for the Lower Delaware River Valley Region. The policy lessons involve estimates of the costs of meeting varying standards on air and water quality and the impact on those costs of certan region-wide management alternatives. The research lessons concern: (a) the desirability of considering air and water quality and solid waste disposal simultaneously in a single model; (b) the costs of and returns to including nonlinear models of natural systems in a regional optimization framework; and (c) the feasibility of working with constraints on the geographic distribution of the costs of environmental quality improvement within the regional, nonlinear model. The authors believe that it will generally be worthwhile to include intermedia linkages in regional management models because the potentially valuable information appears to come at a fairly low price, the additional work and expense involved in integrading three separate media models being small. Nonlinear ecosystem models to provide additional potentially useful information. Linear programming models are more useful than nonlinear models for the investigation of the distributional implications of various regional management strategies. (Bell-Cornell)
W77-10292

OPTIMAL DESIGN OF MECHANICAL AERATION SYSTEMS FOR THERMALLY AND ORGANICALLY POLLUTED STREAMS,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
S. H. Lin.
International Journal of Sytems Science, Vol. 8, No. 1, p 111-120, January 1977. 6 fig, 14 ref.

Descriptors: *Streams, *Water pollution control, *Simulation analysis, *Design, *Aeration, *Optimization, Effects, Economic efficiency, Water temperature, Biochemical oxygen demand, Dissolved oxygen, Organic wastes, Thermal pollution, Constraints, Capital costs, Maintenance costs, Operating costs, Pumps, Equations, Mathematical models, Operation research.
Identifiers: Cost minimization, Streeter-Phelps model.

The systems approach is used for synthesizing an optimal mechanical aeration system for a stream receiving multiple thermal and organic waste discharges. It is assumed that a modified version of the Streeter-Phelps model is adequate for describing the stream water quality as characterized by the variations of the temperature, biochemical oxygen demand (BOD) and sissolved oxygen concentration. the system cost function which comprises, the capital costs, the labor and maintenance cost, and the operating cost, is formulated using the available data in the literature. To minimize the total system cost, a maximum allowable end BOD constraint is used. It is found that the total system cost is very critical to the BOD costraint imposed at the end of the reach of stream under consideration. The effect of the waste discharge structure on the total system cost is vary significant. The system with thermal discharge prior to organic discharge is by far better than the opposite. (Bell-Cornell)
W77-10293

REDUCTION OF 2, 4-D LOAD IN SURFACE RUNOFF DOWN A GRASSED WATERWAY,
Agricultural Research Service, Tifton, Ga. Southern Region.
L. E. Asmussen, A. W. White, Jr., E. W. Hauser, and J. M. Sheridan.
Journal of Environmental Quality, Vol 6, No 2, p 159-162, April-June 1977. 4 fig, 3 tab, 8 ref.

Descriptors: *Herbicides, *Grassed waterways, *Water pollution, *Agricultural chemicals, *Watershed management, Pesticides, 2-4-D, Weed control, Surface drainage, Agricultural watersheds, Surface runoff, Coastal plains, Pesticide removal, Pollutants, Sediments, Surface runoff, Watersheds(Basins).
Identifiers: Environmental contamination, Simulated rainfall, Cowarts loamy sand.

The effectiveness of a grassed waterway in decreasing 2,4-D ((2,4-dichlorophenoxy) acetic acid) content in surface runoff was investigated. Corn plots were treated with 2,4-D (0.56 kg/ha) and runoff produced by applying simulated rain was directed through a 24.4-m-long grassed waterway. The 2,4-D concentrations were measured under wet and dry antecedent waterway and plot conditions. Reduction in 2,4-D load in waterways results from water loss by infiltration, sediment loss, and by attachment-absorption on vegetative and organic matter. Of the simulated rainfall applied 1 day after application of 2,4-D, 50% of the water ran off the plots under dry antecedent soil conditions, and 78% ran off under wet conditions. Infiltration reduced runoff flowing down the waterway an additional 25% under dry conditions and 2% under wet conditions. Suspended sediment reduction in the waterway was 98 and 94% of the total amount moving from the plot for the dry and wet waterway conditions, respectively. The total loss (on sediment and in solution) of the applied 2,4-D from the plot in the dry and wet states was 2.5 and 10.3%, respectively. (Henley-ISWS)
W77-10323

MEETING EFFLUENT DISCHARGE REQUIREMENTS AND WATER REUSE,
Eutek Inc., Sacramento, Calif.
For primary bibliographic entry see Field 5D.
W77-10343

NATIONAL EFFLUENT REQUIREMENTS FOR THE MEAT AND POULTRY INDUSTRY,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5D.
W77-10345

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
J. F. Boyer, and V. Gleason.
Journal Water Pollution Control Federation, Vol. 19, No. 6, p 1163-1172, June, 1977.

Descriptors: *Mine drainage, *Acid streams, *Strip mine wastes, *Coal mines, *Acid mine water, Mining, Mine water, Strip mines, Waste dumps, Geochemistry, Trace elements, Neutralization, Sedimentation, Suspended solids, Industrial wastes, Waste water treatment, Water quality, Bioassay, Pollutant identification, Reviews, *Bibliographies.

A review of acid mine drainage, its associated problems, and their causes is presented. Current methods for controlling acid mine drainage and processes under investigation are outlines, including lime neutralization and the less expensive limestone neutralization. Methods for removal of iron and other cations are also discussed. As coal preparation can result in water pollution through acids, metal ions, silt, or suspended solids, the development of various types of refuse embankments and the disposal of waste water and solids is discussed. Mine sealing, selective handling of overburden, stream diversion, and reclamation of surface-mined areas are described as abatement methods for acid mine drainage. Despite the growing number of successful reclamation and treatment operations, much attention is still being directed towards the effects of acid mine drainage on water quality and stream biology. A survey of ecologic studies is presented. The effects of trace elements, acidity, pH, and irion concentrations are considered with respect to prevention and control. As surface mine production has been steadily increasing, problems related to surface mining are also increasing. Recent literature and various methods for controlling erosion, sedimentation, siltation, and subsidence are discussed. (Schulz-FIRL)
W77-10355

RAPID ANALYSIS OF ACID MINE DRAINAGE,
West Virginia Univ., Morgantown. Coal Research Bureau.
For primary bibliographic entry see Field 5A.
W77-10356

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED STATES.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10357

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED KINGDOM.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10358

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FINLAND.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10359

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN JAPAN.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10360

AN ECOSYSTEM APPROACH TO THE PLANNING OF WATER POLLUTION CONTROL,
University of New England, Armidale (Australia). School of Natural Resources.
I. H. Fisher.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p. 39-43. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Water pollution control, *Ecosystems, *Model studies, *Australia, Environmental control, Water pollution effects, Urbanization, Bays.
Identifiers: Westernport Bay(Vic).

For the purpose of planning control policies, two types of polluted water systems are distinguished on the basis of the effect of proposed human modification on the interactions currently operative within the system. If this effect is small, an engineering systems analysis, which relies on data collected before the modification occurs, is a suitable set of techniques by which to obtain the control policies. However, if the effect is large, then a quantitative model is needed which incorporates a representation of the processes governing system behaviour, both before and after modification occurs. In general this will involve biological phenomena about which little is known, particularly under Australian conditions. Conducting a sensitivity analysis of these models is one of the few available methods of controlling pollution-control policies which can account for the important, often dynamic, influence of these phenomena on system behaviour. Industrial and associated development of Westernport Bay, Victoria, Australia, is used to illustrate this second approach. (CSIRO)
W77-10367

EXPERIENCE WITH THE DESIGN AND OPERATION OF SMALL EXTENDED OPERATION AERATION WASTEWATER TREATMENT PLANTS,
Gutteridge, Haskins and Davey Pty Ltd., Melbourne (Australia).
For primary bibliographic entry see Field 5D.
W77-10368

A NEW CODE FOR REDUCING STREAM SILTATION,
Environment Protection Authority, Melbourne (Australia).
For primary bibliographic entry see Field 4D.
W77-10369

APPROACH TO LIQUID EFFLUENT CONTROL IN A NITROGENOUS FERTILIZER PLANT,
Consolidated Fertilizers Ltd., Newcastle (Australia).
C. McCallum.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p 126-129. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Effluents, *Industrial wastes, *Nitrogen compounds, *Water pollution control, *Australia, Ammonium salts, Nitrates, Nutrient removal, Waste water treatment, Pollutants, Rivers, Streams.
Identifiers: Hunter River(N.S.W.), Newcastle(N.S.W.).

A reduction in the quantities of nitrogenous compounds entering the site effluent mains has been achieved at a fertilizer plant in Newcastle, New South Wales, Australia. The methods employed, chosen with particular attention to the safety of plant and personnel, are described. The use of an outfall diffuser together with additional means of further removing and recycling ammonium wastes are now being evaluated as ways of reducing the impact of effluents on the Hunter River. (CSIRO)
W77-10370

VARIATIONS IN EFFLUENT QUALITY AND THE IMPLICATIONS FOR SETTING EFFLUENT STANDARDS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. Barnes, and F. Wilson.
In: Environmental Engineering Conference, Canberra, Australia, 1977. The Institution of Engineers Australia, Preprints of Papers, p 130-134. (The Institution of Engineers Australia National Conference Publication No. 77/4).

Descriptors: *Water quality standards, *Legislation, Effluents, Water pollution control, Streams, Storm water, Sewage effluents, Regulation, *Australia.

Several criteria have been proposed for setting effluent standards, including exact effluent specifications, average values and water use. In practice criteria often become unworkable or inefficient because of a lack of analytical data. Particular problems are associated with the control and treatment of storm water flows, the variability of effluent from small sewage works including septic tanks, the methods employed to estimate river quality, and the implications of continuous monitoring devices. Effective discharge criteria must accommodate the demands of river quality, economic treatment processes, water usage and analytical methods. (CSIRO)
W77-10371

THE PUSH TO EASE WATER RULES.
For primary bibliographic entry see Field 6E.
W77-10446

CHICAGO CLEANUP: INDUSTRY OUTDOES THE CITY.
For primary bibliographic entry see Field 6E.
W77-10447

THE EFFLUENT LIMITATIONS CONTROVERSY: WILL CARELESS DRAFTMANSHIP FOIL THE OBJECTIVE OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
National Wildlife Federation, Washington, D.C.
P. A. Parenteau, and N. Tauman.
Ecology Law Quarterly, Vol 6, No 1, p 1-59, 1976.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Federal jurisdiction, *State jurisdiction, Water pollution, Effluents, Industrial wastes, Water pollution sources, Water policy, Judicial decisions, Legal review, Regulation, Administrative agencies, Legislation, Standards, Water quality standards, Political aspects.
Identifiers: *Administrative regulations, *Effluent limitations, *Environmental policy, *Federal Water Pollution Control Act Amendments of 1972, Point sources(Pollution), National Pollution Discharge Elimination System, Effluent guidelines, Environmental Protection Agency.

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA Amendments of 1972) contain an important pollution abatement device called effluent limitation. By applying progressively stricter effluent limitations according to technological improvements in pollution control, the Act seeks to achieve its goal of elimination of pollutant discharges by 1985. The device has been seriously challenged on a variety of fronts by various industries which find it an unwarranted burden on legitimate enterprises. Seven courts of appeal have adopted conflicting interpretations of those sections of the Act dealing with effluent limitation. At issue is the power of the Environmental Protection Agency (EPA) administrator to set standards and whether they will be given uniform effect. This article examines in depth the litigation and the validity of the various court holdings. The authors conclude that Congress intended to adopt a uniform approach to standard-setting, but by using ambiguous language, failed to spell out the procedure by which standards were to be set. They urge that the EPA's uniform standards position ought to be adopted by the Supreme Court. Two cases in which the Court has granted certiorari may provide the means for resolution of the disputes. (Jones-Florida)
W77-10452

THE SUPREME COURT INTERPRETS THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY IN REGULATING RADIOACTIVE MATERIALS,
For primary bibliographic entry see Field 6E.
W77-10455

DEEPWATER PORT ACT OF 1974: SOME INTERNATIONAL AND ENVIRONMENTAL IMPLICATIONS,
For primary bibliographic entry see Field 6E.
W77-10456

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
V. P. Wilson.
Environmental Affairs, Vol 5, No 3, p 545-66, Summer 1976.

Descriptors: *Federal Water Pollution Control Act, *Groundwater, *Water pollution control, *Pollution abatement, Water pollution, Legislation, Injection wells, Pollutants, Navigable waters, Surface waters, Groundwater movement, Flow, Surface-groundwater relationships, Water supply, Groundwater resources, Common law, Water law, Legal aspects.
Identifiers: *Groundwater management, *Territorial waters, Safe Water Drinking Act(SWDA).

Groundwater pollution is now controlled by three legal mechanisms. The least effective of these is an action at common law because such actions are only available to persons who have a possessory interest in land damaged by the pollution. The second method, the Safe Water Drinking Act (SWDA), protects underground sources of drinking water. However, the protection of the SWDA is limited to sources which supply public systems and which the Administrator determines are endangered by underground injection. The most effective tool available to control groundwater pollution is the Federal Water Pollution Control Act (FWPCA). The FWPCA's objective is to eliminate the discharge of pollutants into navigable water by 1985. At issue is whether the term 'navigable water' includes groundwater. The Act defines 'navigable water' as the waters of the United States. No attempt is made to limit or exclude groundwater from this definition. Despite this definition, a recent case held only certain groundwaters are protected by the Act. This interpretation limits the effectiveness of the FWPCA as an effective tool in abating groundwater pollution. The commentator feels that the case is wrong and that groundwater is protected by the Act. (Petruff-Florida)
W77-10458

WATERS OF THE UNITED STATES: DOES FEDERAL CONTROL INUNDATE THE WETLAND (COMMENT ON US V HOLLAND),
For primary bibliographic entry see Field 6E.
W77-10463

USE OF THE COMMERCE CLAUSE TO INVALIDATE ANTI-PHOSPHATE LEGISLATION: WILL IT WASH. (SOAP AND DETERGENT ASSOCIATION V CHICAGO).
For primary bibliographic entry see Field 6E.
W77-10464

FEDERAL AND FLORIDA LAW CONCERNING OIL POLLUTION,
Florida Univ., Gainesville. School of Law.
For primary bibliographic entry see Field 6E.
W77-10467

WASTE HEAT UTILIZATION FROM THERMAL POWER PLANT IN NEW YORK STATE,
For primary bibliographic entry see Field 6E.
W77-10468

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 2, p 914-28, January 5, 1976.

Descriptors: *Standards, *Organic wastes, Federal Water Pollution Control Act, *Chemical industry, *Chemical wastes, Chemicals, Chemical degradation, Regulation, Technology, Pollutants, Political aspects, Organic compounds, Organic matter, Effluents, Federal government, Pollution abatement, Pollutant identification, Treatment, Treatment facilities, Wastes, Waste treatment, Waste disposal.
Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972.

Section 301 of the Federal Water Pollution Control Act requires the achievement by not later than July 1, 1977 of effluent limitations for point sources, other than publicly owned treatment works, which require the application of the best practicable control technology currently available, as defined by the Administrator of the Environmental Protection Agency (EPA). Guidelines for effluent limitations within the organic chemical manufacturing point source category include the following subcategories: (1) nonaqueous processes; (2) processes with process water contact only as steam dilvent, or quench or vent gas absorbents; (3) aqueous liquid-phase reaction systems; and (4) the latch and semi-continuous processes. The EPA hereby proposes guidelines and standards applicable to the above-stated subcategories. They include: effluent limitations for existing sources, standards of performance for new sources, and pretreatment standards for existing sources. (Josepher-Florida)
W77-10472

APPLICATION OF PERMIT PROGRAM TO SEPARATE STORM SEWERS.
Federal Register, Vol 41, No 54, p 11303-07, March 18, 1976.

Descriptors: *Permits, *Storm drains, *Storm runoff, *Surface runoff, *Drainage systems, Federal Water Pollution Control Act, Regulation, Cities, Urban drainage, Urbanization, Water pollution sources, Federal government, Administrative agencies, Legal aspects, Water pollution, Control, Water pollution control, Legislation, Waste water(Pollution), Sewers.
Identifiers: *Administrative regulations, National Pollutant Discharge Elimination System (NPDES), Certification.

The Environmental Protection Agency (EPA) has promulgated regulations for applying the National Pollutant Discharge Elimination System (NPDES) permit program to separate storm sewers. The term 'separate storm sewer' is defined as a conveyance or system of conveyances located in an urbanized area and primarily operated for the purpose of collecting and conveying storm water runoff. The permit issuing authority may designate a rural storm sewer system as being a significant contributor of pollution and thus subject to these regulations. Discharges of pollutants from separate point sources not part of the separate storm sewer system are not subject to these provisions but rather the general provisions concerning point sources. The EPA has summarized the comments made on the regulations by interested members of the general public and has responded thereto. The EPA has emphasized that the separate storm sewer regulations were issued in accordance with a court order in NRDC v. Train. The EPA has taken an appeal of this case and therefore the final status of the promulgated regulations is as yet unknown. (Moorhouse-Florida)
W77-10473

PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 40, No 97, p 21740-41, May 19, 1975.

Descriptors: *Federal Water Pollution Control Act, *Legislation, *Plastics, Effluents, Standards, Federal government, Legal aspects, Legal review, Governments, Administration, Regulation, Classification.

The Environmental Protection Agency (EPA) has proposed amendments to the COD parameter in the Polypropylene Subcategory. The EPA is therefore amending the 1983 and new source regulation to reflect an effluent concentration of 75 mg per litre rather than 100 mg per litre, a decrease in the new source standard and the 1983 limitation for COD for Polypropylene of 25%. The recommended treatment technology was discussed in the final 'Development Document'. The proposed amendment does not involve any changes which would affect any environmental or non-environmental impact. (Hadoulias-Florida)
W77-10474

WARD V COLEMAN (CONSTITUTIONALITY, AND THE CRIMINAL OR CIVIL NATURE OF FINES UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W77-10479

VANDERVELDE V CITY OF GREEN LAKE (AUTHORITY OF CITY TO REQUIRE USE OF CITY WATER AND SEWER MAINS).
For primary bibliographic entry see Field 6E.
W77-10480

UNITED STATES V ALLIED CHEMICAL CORPORATION (MULTIPLE-COUNT INDICTMENTS FOR WASTE DISCHARGE VIOLATIONS OF THE RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 6E.
W77-10481

UNITED STATES V ATLANTIC RICHFIELD COMPANY (ABSOLUTE LIABILITY FOR OIL SPILLS UNDER FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 6E.
W77-10484

NATIONAL RENDERERS ASSOCIATION V ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF EPA EFFLUENT LIMITATIONS FOR RENDERERS).
For primary bibliographic entry see Field 6E.
W77-10498

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR CAUSING DISCOLORATION OF SURFACE WATER).
For primary bibliographic entry see Field 6E.
W77-10499

RELEASING DEAD ANIMALS, ETC., INTO OR NEAR WATERS.
For primary bibliographic entry see Field 6E.
W77-10501

LIVING WITH THE LAKE. A GUIDE TO ILLINOIS LAKESHORE MANAGEMENT.
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
Illinois Coastal Zone Management Program Publication, (1976), 24 p.

Descriptors: *Coasts, *Management, *Shore protection, *Water quality control, *Illinois, *Lake Michigan, Land use, Recreation, Economics, Erosion.
Identifiers: *Coastal zone management, *Resource management.

The Illinois Coastal Zone Management Program recommends four basic goals with specific objectives for each. The goals are: Protect, enhance and restore Lake Michigan waters and Illinois shorelands to the extent practicable; Minimize property damage from shore erosion and flooding along the Illinois shoreline of Lake Michigan; Enhance opportunities for recreational activity along the Illinois shore of Lake Michigan; and Enhance Lake-related commercial and industrial activities to contribute to the economic well-being of Illinois. (NOAA)
W77-10504

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM: COMPONENT STUDY OF BIOLOGICAL COMMUNITIES.
Illinois Natural History Survey, Urbana.
For primary bibliographic entry see Field 2H.
W77-10505

DISPOSAL OF SALT WATER DURING WELL CONSTRUCTION, PROBLEMS AND SOLUTIONS,
Geological Survey, Miami, Fla. Water Resources Div.
W. A. J. Pitt, Jr., F. W. Meyer, and J. E. Hull.
Ground Water, Vol. 15, No. 4, p 276-283, July-August, 1977. 6 fig, 1 tab.

Descriptors: *Injection wells, *Drilling, *Water pollution sources, *Saline water, Aquifers, Drilling fluids, Sewage disposal, Monitoring, Pumping, Groundwater, *Florida.
Identifiers: Miami(Florida), West Palm Beach(Florida).

Recent interest in disposal of treated sewage effluent by deep-well injection into saline aquifers has increased the need for proper disposal of salt water as more wells are drilled annually. Three cases of contamination of an unconfined aquifer in Florida by salt water spilled or discharged from wells trapping the underlying saline aquifer are examined in this study. In two cases, near Miami, contamination resulted from disposal of salt water into unlined surface bits during injection well construction. At the third site near West Palm Beach, minor contamination was caused by accidental spills during construction. Precautions taken at the latter site included the use of a brine injection well for disposal of saline water and a closed circulation drilling system to minimize spillage. A concurrent monitoring program facilitated early detection of salt spill effects, thus, mapping of the contaminant and restoration efforts were effective and relatively inexpensive. Suggestions for further increasing the safety of drilling into saline aquifers

include the construction of impermeable drilling pads with gutters and employing special procedures for handling drilling muds. (Eberle-NWWA)
W77-10519

PROTECTING GROUND WATER FROM DOMESTIC WASTEWATER EFFLUENT,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol. 31, No. 6, p 34-35, June, 1977. 2 fig.

Descriptors: *Domestic wastes, *Waste water disposal, *Water wells, *Water pollution sources, Water supply, Septic tanks, Nitrates, Viruses, Water purification.

Domestic wastewater effluent goes through a series of treatment processes as it moves through an on-site disposal system. Nevertheless, as this effluent seeps out of the leaching beds and into the soil, it often contains biological and chemical components that represent a hazard to the quality of ground water. Most pollutants are reduced to insignificant quantities at a depth of eight feet; approximately 40 feet of silty clay, however, is needed to eliminate viruses and nitrates from infiltrating wastewater. The minimum protective distance between the intake of a water supply well and the discharge of wastewater effluent has a vertical well depth component (d) plus a horizontal distance component (h) such that the diagonal distance is sufficient to remove all potential pollutants. The following distance formula is frequently cited by sanitarians: h = (165,000/d) times the square foot of (Si/d), where Si is a coefficient of purification capacity of all strata penetrated when drilling a well. This formula can be referred to in conjunction with state and local regulations for placing a well safely away from the influence of nearby wastewater disposal sytems. (Eberle-NWWA)
W77-10520

NEBRASKA ISSUES REGULATIONS UNDER SAFE DRINKING WATER ACT OF 1976.
Johnson Drillers Journal, Vol. 49, No. 3, p 13, May-June, 1977.

Descriptors: *Water law, *Potable water, Groundwater, Water quality control, Regulation, *Nebraska, *Water quality standards.

Regulations governing public water supply systems in Nebraska have been adopted by that state's Board of Health. 1974 federal legislation set standards for water safety. In 1976, the state legislature passed the Safe Drinking Water Act calling for development of a program to test water supply systems and regulate water safety standards. Few severe problems with water in Nebraska are expected in the near future, however, presence of organic chemicals in groundwater and nitrates in the water supplies of 45 cities are causing some concern among state officials. (Eberle-NWWA)
W77-10523

WASTEWATER MANAGEMENT PROGRAM, JAMAICA BAY, NEW YORK, VOLUME I: SUMMARY REPORT,
Ludwig (H. F.) and Associates Engineering-Science, Inc., Arcadia, Calif.
For primary bibliographic entry see Field 5D.
W77-10533

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTE WATER TREATMENT,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
For primary bibliographic entry see Field 5D.
W77-10535

METHODOLOGY FOR RIVER-QUALITY ASSESSMENT WITH APPLICATION TO THE WILLAMETTE RIVER BASIN, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 7A.
W77-10565

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5E.
W77-10579

WASTEWATER PHOSPHORUS REMOVAL USING LAND APPLICATION,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
For primary bibliographic entry see Field 5D.
W77-10606

MANAGEMENT ALTERNATIVES FOR LAND TREATMENT SYSTEMS,
Culp/Wesner/Culp-Clean Water Consultants, El Dorado Hills, Calif.
G. L. Culp, and D. J. Hinrichs.
Public Works, Vol. 108, No. 6, p 78-79, June, 1977.

Descriptors: *Waste water management(Applied), *Irrigation, Waste disposal, Equipment, Maintenance, Costs, Crops, Administration, Waste water treatment.

Alternative solutions were suggested for management problems related to land treatment systems. The problems considered were operation of the irrigation system; planting, cultivating, and harvesting of crops; and ownership of the land. One method involved ownership of the land and operation of the irrigated-agriculture project by one agency. Its main advantage was complete agency control of the treatment and irrigation systems. Problems included staffing, equipment costs, and maintenance costs. Maximized crop revenues could offset operating costs. A perennial crop would require less tillage and save equipment and personnel costs. A solid-set or a center pivot type system requires less labor. The crop should be compatible with local crops to utilize local knowledge and markets. Agency ownership of the land and contracted farming activities was another choice. This relieves some equipment and labor costs, but creates problems or priority. Its waste water treatment or maximization of crop revenues more important. A compromise solution would be agency ownership and irrigation operation, with only crop planting and harvesting activities contracted. This provides complete control of the entire system and avoidance of farm labor and equipment charges. Timing harvest to maximize crop yield may become a problem. There was also the option of leasing the lands for irrigation operations. Another prospect was the provision of water to a farmer or group of farmers who need water and may already possess irrigation equipment. The choice of management approach should depend upon local agency constraints and concerns. (Collins-FIRL)
W77-10637

MULTIFUNCTIONAL APPROACH TO POLLUTION PREVENTION,
Yorkshire Water Authority (England).
T. W. Raven.
Water Pollution Control, Vol. 76, p 222-231, 1977.

Descriptors: *Water pollution control, *Water districts, *Administration, Analysis, Inspection, Monitoring, Planning, Treatment facilities, Standards, Waste water treatment.

The reorganization of the Yorkshire Water Authority, with an emphasis on pollution prevention, was described. The major concern was to reconcile the Authority's position as pollution control overseer with is creation of pollution as a byproduct of water treatment. Emphasis was placed on making the scientific services multifunctional. The objective was to combine responsibility for analysis of water, trade effluents sewage treatment and river samples. This would effectively eliminate large scientific staffs at individual facilities. Pollution prevention was divided into the areas of inspection, monitoring, examining waste treatment planning applications, developing procedures for emergency pollutions, keeping the public informed, and establishing effluent standards. (Collins-FIRL)
W77-10638

THE (WEST GERMAN) WASTE WATER DISCHARGE TAX LAW (DAS ABWASSERABGABENGESETZ),
Technische Universitaet, Darmstadt (West Germany).
H.-L. Dalpke.
Der Papiermacher, Vol 27, No 2, p 20-23, 28-29, February 12, 1977. 7 ref, 2 tab.

Descriptors: *Pollution taxes(Charges), *Water law, *Waste water disposal, *Foreign countries, Legislation, Water pollution control, Discharge measurement, Pulp and paper industry, Effluents, Europe, Waste water treatment, Discharge(Water), Permits, Regulation, Water permits, Industrial wastes, Taxes, Organic loading.
Identifiers: *West Germany.

In an update of a previous article (cf. Selected Water Resources Abstracts, Vol 9, No 12, p 89, Section 5G, abstracts W76-05712, June 15, 1976) the development of the West German industrial effluent discharge tax law is discussed, especially with respect to pollution load evaluation principles prescribed. Data are also reviewed concerning the specific effluent loads of model paper mills with various assumed levels of effluent treatment, and measures for reducing pollution loads in accordance with the law are outlined. (Speckhard-IPC)
W77-10695

A LONG-RANGE PROGRAM FOR MEETING THE PAPER INDUSTRY'S ENVIRONMENTAL PROTECTION TECHNICAL INFORMATION NEEDS,
National Council of the Paper Inustry for Air and Stream Improvement, Inc., New York.
I. Gellman.
Tappi, Vol. 60, No. 4, p 72-74, April, 1977.

Descriptors: *Pollution abatement, *Pulp and paper industry, *Air pollution control, Ecology, Environment, Waste disposal, Planning, Information exchange, Public health, Aesthetics, Land use, Regulation.

A plan to guide the U.S. pulp and paper industry in environmental problem studies has been designed by NCASI (National Council of the Paper Industry for Air and Stream Improvement). Principal areas of public concern include the impact of pollutants on human health and the aesthetic effects of these pollutants. There will be pressure on the industry to develop new technology to reduce mill discharge pollutants in an efficient and cost effective manner. Land-use regulation and public scrutiny of industry activities will be important in future industry planning and growth. Public and private capital and energy resources are inadequate to meet short-term regulatory program requirements. The plan covers specific problems in these general areas and will be updated regularly as new information becomes available. (Sykes-IPC)
W77-10720

A GROWTH AND DEVELOPMENT MODEL FOR WATER RESOURCE POLICY,
Florida Atlantic Univ., Boca Raton.
For primary bibliographic entry see Field 6B.
W77-10747

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: TEXTILES INDUSTRY,
Little (Arthur D.), Cambridge, Mass.
D. Hefler.
Available from the National Technical Information Service as PB-243 906, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-230-2-75-028, June 1975. 181 p, 10 fig, 95 tab, 1 tab. EPA 68-01-1541.

Descriptors: *Textiles, *Pollution abatement, *Economic impact, Industrial plants, Employment, Prices, Industries, Waste treatment, Cost analysis.
Identifiers: *Effluent guidelines, Best available technology, Best practicable technology, Wool, Fabrics, Dyeing.

The economic impact on the wool scouring, wool dyeing and finishing, woven fabrics dyeing and finishing, knit fabric dyeing and finishing, and stock and yarn dyeing and finishing categories of the textile industry of effluent guidelines for the best practicable technology (BPT), the best available technology (BAT), and new source performance standards (NPS) is examined. Emphasis is on estimating mill closings rather than total industry costs. It is concluded that added costs resulting from meeting BPT guidelines would primarily affect smaller, independent companies, and could not be readily passed on to mill customers, since the price structure is determined by the larger corporations which already meet BPT standards. There would be no mill closings in the woven or knit fabric dyeing and finishing categories due to compliance with BPT and BAT guidelines. Two wool scouring and two wool dyeing and finishing mills would close because of BPT compliance, and 3 additional wool dyeing and finishing mills would close because of BAT requirements. One stock and yarn dyeing mill would also be affected by BAT standards. Though the estimated employment and production curtailment would be minimal in terms of the total industry, local community impact could be substantial for small communities when they account for up to 30% of a town's direct employment. (Luedtke-Wisconsin)
W77-10749

EFFECTS OF INCREASED FERTILIZER RATES ON NITROGEN CONTENT OF RUNOFF AND PERCOLATE FROM MONOLITH LYSIMETERS,
Agricultural Research Service, Temple, Tex.
F. W. Chichester.
Journal of Environmental Quality, Vol. 6, No. 2, p 211-217, April-June 1977. 4 fig, 6 tab, 9 ref.

Descriptors: *Nitrogen compounds, *Fertilizers, *Nitrates, *Leaching, *Agricultural chemicals, Water quality, Nutrients, Pollutants, Water chemistry, Nitrogen, Water pollution sources, Percolation, Runoff, Hydrology, Soil chemistry, Agricultural runoff, Fertilization.
Identifiers: *Nitrate leaching, *Crop management, Meadows, Monolith lysimeters, Percolate water, Nitrogen transport.

Nitrogen (N) fertilizer was applied to meadow and corn cropped lysimeters at rates up to 322 and 672 kg/ha per year, respectively, to determine the effects on chemical quality of surface water. Runoff and percolate samples collected from May 1971 through April 1975 were analyzed for inorganic and total N content. Results were evaluated from crop and soil cover treatment differences and were compared with data from a similar, earlier study on the same lysimeters in which very low rates of N fertilizer were used. Nitrogen losses in runoff were greatest in the summer when intense rainfall events occurred shortly after the date of fertilizer application. Nitrogen loss by leaching was greatest during the winter when percolation rates increased because of low evapotranspirational demand. Results of the study demonstrated that improved fertilizer management, involving application rates in balance with crop nutrient requirements, soil incorporation of fertilizer materials, and adequate soil cover, will minimize runoff and leaching losses which reduce fertilizer efficiency and adversely affect water quality. (Henley-ISWS)
W77-10773

HYDRAULIC MODELING OF MIXING IN STRATIFIED LAKES,
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
For primary bibliographic entry see Field 2H.
W77-10798

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

NATIONAL AND INTERREGIONAL MODELS OF LAND USE, WATER ALLOCATION, SOIL LOSS CONTROL, AND AGRICULTURAL POLICY,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
K. J. Nicol, E. O. Heady, and J. C. Wade.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 90-96, Special Edition 1976. 3 fig, 6 tab, 5 ref.

Descriptors: *Model studies, Crop production, Agriculture, *Simulation analysis, Economics, *Regional analysis, *Water policy, Land use, Water allocation(Policy), Soil erosion.
Identifiers: National models.

National models of agriculture are useful tools to evaluate policy alternatives affecting the agricultural sector and other sectors of the economy that interact with agriculture. This model allows for the analysis of environmental policy and its impacts on agriculture. Regional shifts in production result as the maximum allowable level of gross field loss of soil is reduced to 11,200 kg/ha. Shifts in farming method, inputs, and machinery compliments are needed to facilitate this reduction in soil loss. Different stages of research and analysis being built on a given family of models are presented. The progress reported does not represent a terminal point in this model development. Additional stages are being developed, and the general model will be extended to include further specifications of land and water use, agricultural technology, environmental impacts, export potential, and farm policies as these relate to farm income, rural employment, consumer food costs, environmental quality, and other social and physical variables. (Skogerboe-Colorado State)
W77-10171

OPTIMAL EXPANSION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT: VOLUME I),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 6F.
W77-10263

COMPUTER APPLICATIONS TO ACHIEVE OPTIMUM ECONOMIC LOADING OF GENERATING PLANTS,
Tennessee Valley Authority, Knoxville.
W. Zumwalt.
In: The Tennessee Valley Authority Experience, Proceedings of the First Conference on Case Studies of Large Scale Planning Projects, October 28-November 1, 1974. Hans Knop (Ed.), CP-76-2, Volume 1, International Institute for Applied Systems Anaylsis, Laxenburg, Austria, 1976. p 395-415. 12 fig.

Descriptors: *Computers, *Electric powerplants, Optimum development plans, Economic efficiency, Water costs, Simulation analysis, Automatic control, Forecasting, Projects, Storage.
Identifiers: *Scheduling, *Hydroplants, *Hydrothermal systems, Economic loading, Monthly load forecasts, Rule curves, Values, Data acquisition, Least cost, Hydro projects.

The optimal scheduling of generation is a complex problem for all power systems, and this complexity increases with the number of and type of generating plants. There are power systems with only thermal plants, power systems with only hydro plants, and hydro-thermal systems. Principal considerations for power systems with only thermal plants are the optimization of maintenance schedules, daily unit selections, and the continuous division of generation among plants and units wo as to minimize costs. For hydro-thermal plants, an additional consideration iws the optimization of the use and distribution of storage, reflecting both streamflow probabilities and the values of stored or storable water as replacement for thermal power. Generation shceduling by the TVA involves the use of several computer applications. Two of these are used directly in scheduling generation by plants, and several others are indirectly involved. The computer applications indirectly involved with generation scheduling are: (1) monthly load forecasts; (2) basic rule curves; (3) system economy rule curves; and (4) values of project storage. Directly involved computer applications include: (1) daily preschedules of generation; and (2) economic dispatch each half hour. These are discussed herein along with programs for a new power system control center. (Bell-Cornell)
W77-10288

DEVELOPMENT OF A COMPREHENSIVE TVA WATER RESOURCE MANAGEMENT PROGRAM,
Tennessee Valley Authority, Knoxville.
W. O. Wunderlich.
In: The Tennessee Valley Authority Experience, Proceedings of the First Conference on Case Studies of Large Scale Planning Projects, October 28-Nov. 1, 1974. Hans Knop (Ed.), CP-76-2, Volume 1, International Institute for Applied Systems Analysis, Laxenburg, Austria, 1976, p 453-535. 19 fig, 12 tab, 24 ref, append.

Descriptors: *Water resources development, *Tennessee Valley Authority, *Programs, *Planning, *Reservoir operation, *Scheduling, *Optimization, *Simulation analysis, Water management(Applied), Alternative planning, Long-term planning, Multiple-purpose reservoirs, River systems, Decision making, Evaluation, Methodology, Reservoir releases, Dynamic programming, Reservoir storage, Constraints, Thermal power, Computers, Flood control, Economic efficiency, Mathematical models, Operations research.
Identifiers: Benefit maximization, Objective functions, System economy, Hydropower, Reduced gradient method, Out-of-kilter-algorithm.

Described is a comprehensive program initiated by TVA to improve the capability of presently-used planning and operation methods for the river and multiple-purpose reservoir system. Discussed are mathematical models for evaluating management alternatives for the real-time system operation. Considered first are simulation models for impact assessment for Browns Ferry Nuclear Plant, showing that the cooling mode which uses all available system capabilities as needed and is compatible with system constraints allows the most efficient operation. Next, methods are compared for finding optimal reservoir release scheduling where

the objective function is maximization of annual benefits considered are: (1) linear programming, using the out-of-kilter-algorithm; (2) discrete differential dynamic programming; (3) dynamic programming by successive approximations (DPSA); and (4) the reduced gradient method. The DPSA algorithm appears most promising due to its simplicity, flexibility for allowing stochastic considerations, and modest computer time requirement. Using DPSA, the development of a long-range planning model for reservoir system operations is described, and the development of a multipurpose objective function for hydropower and flood control used in conjunction with this model is considered. Finally, future development plans are outlined. It is concluded that much work remains to be done in the areas of multipurpose objectiv function develoment, especially for such areas as navigation, water quality, water supply and recreation, and short time step scheduling, to name a few. (Bell-Cornell)
W77-10289

A MATHEMATICAL MODEL FOR TRANSIENT OPEN CHANNEL FLOW: A WATER RESOURCE PLANNING AND MANAGEMENT TOOL,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 2E.
W77-10290

A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL: AN ASSESSMENT,
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-10292

AN EVALUATION OF ECONOMIC AND DEMOGRAPHIC DATA USEFUL IN WATER RESOURCES PLANNING.
Bureau of Economic Analysis, Washington, D.C. Regional Economic Analysis Div.
For primary bibliographic entry see Field 6B.
W77-10295

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2E.
W77-10296

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
Y. Y. Haimes.
McGraw-Hill Series in Water Resources and Environmental Engineering, McGraw-Hill International Book Company, New York, N.Y., 1977. 486 p, 87 fig, 49 tab, 428 ref, 3 append. $39.50.

Descriptors: *Water resources development, *Planning, *Management, *Operations research, *Model studies, *Methodology, *Optimization, Land resources, Linear programming, Dynamic programming, Ecosystems, Projects, Scheduling, River basins, Water supply, Water demand, Water quality control, Effluents, Taxes, Groundwater, Surface waters, Costs, Benefits.
Identifiers: *Hierarchical modeling, *Multilevel optimization, Systems engineering, Nonlinear programming, Newton-Raphson method, Decomposition technique, Quasilinearization, Capacity expansion, System identification, Multiobjectives, Surrogate worth trade-off method, Mixed integer programming.

Presented is a unified, comprehensive, and in-depth discussion of the hierarchical-multilevel approach as applied to the planning, operation, and management of large-scale and complex water resources systems, maintaining a fine line between theory and application. Included is a panorama of systems methodologies and approaches as they apply to water resources development and related land resources, recognizing the importance of legal, institutional, societal and political aspects. Presented are the results of much recent research and many applications to large-scale water resource systems. The book is divided into two parts. Part One considers the fundamentals of systems engineering, providing the reader with most of the mathematical background needed for understanding Part Two, the modeling and optimization of complex water resources systems. Part One discusses in detail numerous optimization techniques, including the Newton-Raphson method and linear and dynamic programming. Part Two considers: (1) modeling and system identification; (2) quasilinearization and ecosystem modeling; (3) project scheduling and capacity expansion; (4) a decomposition approach for optimal scheduling and capacity expansion; (5) multiobjectives in water resources systems; (6) hierarchical modeling; (7) multiobjective analysis in the Maumee River Basin (level-B planning); (8) coordination of supply and demand planning models; (9) hierarchical structures with effluent charges for water quality control; (10) applications of hierarchical modeling to conjunctive management of ground and surface water; and (11) a tax-quota system for the planning and management of groundwater. (Bell-Cornell)
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2A.
W77-10419

STOCHASTIC APPROACHES TO WATER RESOURCES, VOLUMES I AND II,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Lecture notes from: The Institute on Application of Stochastic Methods to Water Resources Problems, Colorado State University Fort Collins, June 30-July 11, 1975. H. W. Shen, P.O. Box 606, Fort Collins, Col., 1976. Vol. I - 519 p, 192 fig, 32 tab, 331 ref. Vol. II - 522 p, 175 fig, 26 tab, 435 ref. H. W. Shen, editor and publisher.

Descriptors: *Water resources, *Stochastic processes, *Hydrology, *Simulation analysis, *Mathematical models, Data collections, Risks, Reservoir operation, Planning, Optimization, Decision making, Statistical methods, Design, Networks, Equations, Water policy, Precipitation, Floods, Droughts, Stormwater, Management, Groundwater, Surface waters, Watersheds(Basins), Sediment yield, Mass transfer, Channels, Systems analysis.
Identifiers: Uncertainty, Stream geometry, Velocity distribution.

This collection of articles comprises two separate volumes and is based upon the lecture notes delivered at the Institute on Application of Stochastic Methods to Water Resources Problems, the Colorado State University, June 30-July 11, 1975. The purpose of the books is to describe current knowledge on the application of stochastic methods to various water resource problems, presenting a reasonably comprehensive collection of information in this field. The volumes can be used as reference books or textbooks. The chapters themselves are interrelated yet can stand individually. Among the topics covered in Volume 1 (Chapters 1-13) are: hydrologic time processes; water use time series; data collection, analysis and instrumentation; long-range changes; risk and uncertainty; optimization and uncertainty; water resources planning; statistical decision theory; parameter regionalization and network design; and worth of data. Volume 2 (Chapters 14-28) considers: statistical theory of extreme values; floods and droughts; reservoir planning and operation; reservoir design; urban stormwater management; groundwater systems; watershed sediment yield; simulation of velocity distribution and mass transfer; stream geometry; alluvial channel bedforms; incipient grain motion on riverbeds; and sediment transport. (See W77-10440 thru W77-10443) (Bell-Cornell)
W77-10439

6B. Evaluation Process

THE SACRAMENTO-SAN JOAQUIN DELTA AND THE EVOLUTION AND IMPLEMENTATION OF WATER POLICY: AN HISTORICAL PERSPECTIVE,
California Univ., Davis. Dept. of History.
For primary bibliographic entry see Field 6E.
W77-10101

IMPROVED LOCAL PLANNING FOR RESERVOIR-ORIENTED RECREATION OPPORTUNITIES,
Illinois Univ. at Urban-Champaign. Dept. of Forestry.
J. F. Dwyer, and R. D. Espeseth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 470, Price codes: A08 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 123, June 1977. 142 p, 10 fig, 23 tab, 85 ref. S-053-ILL.

Descriptors: *Recreation, *Reservoirs, *Planning, *Local governments, *Illinois, *Economic impact, *Social impact, Costs, Forecasting, Coordination, Governmental interrelations, Post-impoundment, Attitudes.
Identifiers: *Lake Shelbyville(Ill).

Water-based recreation is becoming an increasingly important aspect of water-resources management. However, there is a great deal of uncertainty about its local socio-economic impact. This uncertainty has played a key role in debates over the construction of reservoirs in Illinois. While much attention has been given to predicting expected impacts of reservoirs, there has been little investigation of the actual impacts, and very little attention has been given to evaluating the effectiveness of various approaches to dealing with those local impacts that do indeed result from water-resources-management projects. This study looks at the actual recreation-induced local impacts of Lake Shelbyville, a multipurpose reservoir constructed by the U.S. Army Corps of Engineers in central Illinois. The reservoir began filling in 1969 and is a major recreation attraction (three million visitor days annually) in a predominately agricultural region. The study is exploratory. It identifies significant impacts and suggests how these impacts may be predicted and dealt with. Significant attention is given to impacts on local government costs and revenues as well as needed intergovernmental cooperation. Local impacts were significantly different from what was expected; local residents and recreationists using the lake could benefit from improvements in local planning and intergovernmental cooperation.
W77-10102

PROCEEDINGS: MINNESOTA'S WATER RESOURCES IN THE YEAR 2000, A CONFERENCE ON PLANNING AND MANAGEMENT.
Minnesota Univ., Minneapolis. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 670, Price codes: A04 in paper copy, A01 in microfiche. Proceedings held at Spring Hill Center, Wayzata, Minnesota, March 1-2, 1977. Water Resources Research Center, Bulletin 92, April, 1977. 68 p. OWRT A-999-MINN(45).

Descriptors: *Minnesota, *Planning, *Future planning(Projected), *Conferences, *Management, Water resources development, Water quality, Water supply, Navigation, Agriculture, Insustries, Electric generation, Recreation, *Projections.

This is the proceedings of a Conference on Minnesota's Water Resources in the year 2000. Topics include: planning and management; agriculture; electric generation; recreation and tourism; navigation; and waste disposal and water supply. (Waelti-Minnesota)
W77-10177

FORECASTING: THE CHALLENGE TO THE AQUATIC SCIENCES,
Michigan Univ., Ann Arbor. Dept. of Natural Resources; and Michigan Univ., Ann Arbor. Dept. of Zoology.
K. F. Lagler.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 1-6, 1976. 5 fig, 1 tab, 19 ref.

Descriptors: *Forecasting, Limnology, Rheology, Fisheries, Rivers, River basins, Land use, Navigation, Flood control, Power generation, Water consumption, Waste disposal, Exploitation, Natural resources, Public health, Recreation, Model studies, *Water utilization, *Aquatic life.
Identifiers: South Africa.

The over-riding modern and near-future challenge in the aquatic sciences is to forecast the effects of continuing and proposed new water uses, arising from the accelerated inland water resource development caused by population growth, urbanization, industrialization, and intensification of agriculture. No serious scientist in this field can avoid responsibility for prediction; or delay entering the arena of environmental advocacy. Human uses and influences on rivers are arranged in major categories, with examples of problems encountered in comprehensive water resources planning. (So. African Water Info. Center)
W77-10190

DEVELOPMENT OF A COMPREHENSIVE TVA WATER RESOURCE MANAGEMENT PROGRAM,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 6A.
W77-10289

A REGIONAL ENVIRONMENTAL QUALITY MANAGEMENT MODEL: AN ASSESSMENT,
Resources for the Future, Inc., Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-10292

AN EVALUATION OF ECONOMIC AND DEMOGRAPHIC DATA USEFUL IN WATER RESOURCES PLANNING.
Bureau of Economic Analysis, Washington, D.C. Regional Economic Analysis Div.
IWR Pamphlet No. 3, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, April 1975. 18 tab, 5 ref, append.

Descriptors: *Water resources, *Planning, Evaluation, Forecasting, Data collections, *Alternative planning, *Alternative water use.
Identifiers: *Socio-economic data, Data sources, Regional impact assessment, OBERS projections.

In its efforts to plan and evaluate alternative ways of conserving and developing water resources, the U.S. Army Corps of Engineers requires a wide spectrum of information. The Corps is required to incorporate environmental, social, and regional economic effects into a planning process that previously had been dominated by benefit-cost ratios and considerations of national economic gains. The development, accession, and appropriate use of such diverse kinds of data have placed greater burdens on available planning resources. This report is a reference manual which describes the kinds of socio-economic data available from the Department of Commerce, particularly at the Bureau of Economic Analysis, which may be useful for meeting the requirements under different planning tasks. It includes selected data samples and data sources, and it discusses several data problems such as the use of OBERS projects, data integration, and data for normative forecasting. (Bell-Cornell)
W77-10295

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED STATES.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10357

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED KINGDOM.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10358

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FINLAND.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10359

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN JAPAN.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
For primary bibliographic entry see Field 6E.
W77-10360

WATER RIGHTS, CONSERVATION AND RECREATION PLANNING,
Illinois Dept. of Conservation, Springfield.
For primary bibliographic entry see Field 6E.
W77-10445

FLORIDA'S LAND USE RESTRICTIONS: ARE THEY SERVING THE PUBLIC INTEREST,
For primary bibliographic entry see Field 6E.
W77-10465

COST-EFFECTIVE COMPARISON OF LAND APPLICATION AND ADVANCED WASTE WATER TREATMENT,
Environmental Protection Agency, Washington, D.C. Office of Water Programs Operations.
For primary bibliographic entry see Field 5D.
W77-10535

MANAGEMENT ALTERNATIVES FOR LAND TREATMENT SYSTEMS,
Culp/Wesner/Culp-Clean Water Consultants, El Dorado Hills, Calif.
For primary bibliographic entry see Field 5G.
W77-10637

RETHINKING OUR APPROACH TO WATER SUPPLY PROVISION,
London School of Economics and Political Science (England).
J. A. Rees.
Geography, Vol. 61, No. 273 Part 4, p 232-245, 1976. 7 fig, 2 tab, 24 ref.

Descriptors: *Water supply, *Decision making, *Investment, *Water conservation, *Water management(Applied), Water demand, Water reuse, Water allocation(Policy), Water loss, Cost-benefit analysis, Droughts, Planning, Impaired water use, Leakage, Reclaimed water, Pricing, Social aspects, Rural sociology.
Identifiers: United Kingdom.

The customary practice of building more storage reservoirs and overcompensating for projected demands as an answer for droughts and increased usage is questioned in view of the high investment required and the losses of lands with agricultural, recreational and other development potentials. Storage reservoirs also raise additional problems such as dislocation of small rural communities, adverse ecological and/or aesthetic effects, public opposition involving legal action, and the discouragement of technological innovations for alternative water sources. As a substitute to capacity expansion, costs/benefits of water conservation alternatives are discussed. These include reducing leakage lossses in distribution systems, dual water quality supply systems for new towns, urban renewal areas and new housing on the urban fringe, and where industrial users are clustered. Also evaluated is the supply of reclaimed sewage effluent to provide large incustries with process water thus postponing the need for new capital investment. Managing water demand--as differentiated from water requirements--by unit pricing, as opposed to the current British practice of unmetered domestic water, is another conservation alternative evaluated on the basis of the long-run marginal cost of water supply, including capital costs vs. short-run marginal cost of supplying water, and incorporating the treatment and pumping cost variables. (Auen-Wisconsin)
W77-10746

A GROWTH AND DEVELOPMENT MODEL FOR WATER RESOURCE POLICY,
Florida Atlantic Univ., Boca Raton.
R. D. Thomas, and K. G. Baker.
Social Science Quarterly, Vol. 57, No. 2, p 445-454, 1976. 4 ref.

Descriptors: *Decision making, *Water policy, *Priorities, *Attitudes, Local governments, *Florida, Land development, Urbanization, Industries, Pollution abatement, Water resources development, Surveys.
Identifiers: *Economic growth, Housing development, *Public opinion surveys.

How public officials' priorities regarding water resources policy and water pollution problems reflect economic growth and development and how their altitudes are a function of water problem severity was examined by developmental scaling to cross-sectional data derived from a questionnaire survey of Florida county commissioners. The purpose of the questionnaire was to ascertain the relative severity of water problems to one another rather than as a class thus the responses were to indicate the severity of problems involved in water supply for agriculture, domestic purposes, industry, recreation, fish and wildlife, and salinity control; pollution from domestic sewage, industrial and agricultural waste; flooding, drainage, beach erosion; and salt water intrusion. County commissioners attitudes were scaled on the problems of water supply and drainage (generally thought to be associated with programs affecting growth and development and sewage treatment and water pollution (generally considered to be the results of growth). The data suggest that commissioners become progressively less

indecisive about severity of water problems as growth intensifies. Relatively more commissioners from high than low growth counties increasingly perceived all types of water problems as equally severe. The scale suggests that there is substantially more concern among Florida county commissioners about water problems resulting from growth and development as opposed to water problems designed to induce growth. (Auen-Wisconsin)
W77-10747

AN ECONOMIC ANALYSIS OF IRRIGATED FARMING WITH DIMINISHING GROUND WATER RESERVES,
Washington Univ., St. Louis, Mo. Center for the Biology of Natural Systems.
For primary bibliographic entry see Field 4B.
W77-10748

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

OPTIMAL DESIGN OF MECHANICAL AERATION SYSTEMS FOR THERMALLY AND ORGANICALLY POLLUTED STREAMS,
Melbourne Univ., Parkville (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W77-10293

INFLUENCE OF METERING, PRICING POLICIES AND INCENTIVES ON WATER USE EFFICIENCY,
New South Wales Univ., Kensington (Australia). School of Economics.
D. R. Gallagher, and R. W. Robinson.
Australian Water Resources Council Technical Paper No. 19, 1977. 138 p, 48 tab, 28 fig, append.

Descriptors: *Water supply, *Water demand, *Pricing, *Water allocation(Policy), *Australia, Water rates, Water policy, *Water utilization, Marketing, Cities, Public utilities, Water requirements.

Authorities concerned with water supply management have the responsibility of ensuring not only that an adequate quantity and quality of water is supplied, but also that the supplies are efficiently used. The conventional Australian approach to water supply and distribution based on extrapolation of past consumption trends and a rating system which encourages all users to consume at least a minimum amount regardless of need, may lead to the construction of needlessly large water supply systems. An investigation is reported which proceeded on the hypothesis that water price, through the water demand function, could be used as an effective policy tool to achieve efficient control of water supply and use. Urban water use trends, water supply costs and pricing policies in Australia are reviewed; results of surveys of water consumption in two New South Wales sample areas, and the effects of metering on water use, are presented; with a literature review of factors determining water demand. It is concluded that the present state of affairs is a reflection of the statutory obligations of the water authorities, and that these should be altered to allow more attention to demand control in encouraging water use efficiency. (CSIRO)
W77-10374

CAN IRRIGATION WITH MUNICIPAL WASTE WATER CONSERVE ENERGY,
California Univ., Davis. Dept. of Land, Air, and Water Resources.
For primary bibliographic entry see Field 5E.
W77-10579

ECONOMIC ANALYSIS OF EFFLUENT GUIDELINES: TEXTILES INDUSTRY,
Little (Arthur D.), Cambridge, Mass.
For primary bibliographic entry see Field 5G.
W77-10749

6D. Water Demand

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 8B.
W77-10176

FORECASTING: THE CHALLENGE TO THE AQUATIC SCIENCES,
Michigan Univ., Ann Arbor. Dept. of Natural Resources; and Michigan Univ., Ann Arbor. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W77-10190

INFLUENCE OF METERING, PRICING POLICIES AND INCENTIVES ON WATER USE EFFICIENCY,
New South Wales Univ., Kensington (Australia). School of Economics.
For primary bibliographic entry see Field 6C.
W77-10374

EFFICIENCY IN INDUSTRIAL, MUNICIPAL AND DOMESTIC WATER USE,
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.
D. P. Heeps.
Australian Water Resources Council Technical Paper No. 20, 1977. 113 p, 24 fig, 33 tab, 49 ref, 3 append.

Descriptors: *Water utilization, *Cities, *Domestic water, *Australia, Water demand, Water requirements, Water loss, Water reuse, Suburban areas, Industrial water, Municipal water.
Identifiers: *Melbourne(Vic).

Efficiency in water use represents an alternative to developing more costly and remote sources of water supply. A study was undertaken to perform a preliminary investigation of Australian urban water use efficiency, using data collected from eight residential test areas in Melbourne. Major findings were: that unaccounted-for water loss in the system was of the order of 16 per cent., that savings could be effected by discouraging overwatering of gardens and the design and use of domestic appliances with excessive water use; that current water rate levels make the utilization of rainwater storage tanks by householders uneconomic; and that potential currently exists for greater reuse of industrial and municipal effluents for non-potable purposes. A principal recommendation is that continuous monitoring of water use should be started in selected areas to provide long term data for future investigations. (CSIRO)
W77-10375

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART 4. NORTHERN COASTAL PLAIN,
Geological Survey, Raleigh, N.C. Water Resources Div.
T. M. Robison.
North Carolina Department of Natural and Economic Resources report, January 1977. 218 p, 5 fig, 11 ref.

Descriptors: *Water supply, *Water quality, *Surface waters, *Groundwater, *North Carolina, Water resources, Water utilization, Water treatment, Water works, Available water, Water yield, Chemical analysis, Water analysis, Sites, Maps.

This report on the water resources and the larger public water supplies in 23 counties in the northern Coastal Plain Section of North Carolina is divided into two sections. The first describes the method of investigation, an explanation of the information reported for each water supply and its significance to planning, a discussion of the chemical analyses, and a discussion of some of the problems noted during the investigation. The second includes a water-resources appraisal and a map of each county showing the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers that gives: (1) the population served, (2) the adjacent communities served, (3) the number of customers, (4) the source of water, (5) estimated allowable draft, (6) total and industrial water use, (7) raw- and finished-water storage, (8) raw- and finished-water pumping capacity, (9) future plans, (10) a water-resources appraisal in the immediate vicinity of the supply and, (11) the results of chemical analyses of raw and finished water. (Woodard-USGS)
W77-10561

ALBUQUERQUE CLOSES WATER-WASTE-WATER CYCLE.
For primary bibliographic entry see Field 5D.
W77-10633

RETHINKING OUR APPROACH TO WATER SUPPLY PROVISION,
London School of Economics and Political Science (England).
For primary bibliographic entry see Field 6B.
W77-10746

6E. Water Law and Institutions

THE SACRAMENTO-SAN JOAQUIN DELTA AND THE EVOLUTION AND IMPLEMENTATION OF WATER POLICY: AN HISTORICAL PERSPECTIVE,
California Univ., Davis. Dept. of History.
W. T. Jackson, and A. M. Paterson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 469, Price codes: A10 in paper copy, A01 in microfiche. California Water Resources Center, Contribution No. 163, June 1977. Technical Completion Report, 192 p. (California Water Resources Center Project UCAL-WRC-W-501).

Descriptors: *History, *Water policy, *Project planning, *Project post-evaluation, Federal Project Policy, *Saline water intrusion, *California.
Identifiers: *Sacramento-San Joaquin Delta(Calif).

An historical review is presented of the attempts to control the encroachment of salinity from San Francisco Bay into the Delta of the Sacramento and San Joaquin rivers from 1920 to the present. Two basic solutions to the problem were: the physical separation of salt water from fresh water by means of a barrier at some point downstream from the Delta, or the release of sufficient water from upstream storage reservoirs to drive back tidal salinity. Water policy in the Delta has always been intimately linked with plans for the control and redistribution of northern California's water supply, particularly the Central Valley Project and State Water Project. Contrary to the protestations of Delta water users and more recently the State of California, the U.S. Bureau of Reclamation has no historical obligation to control salinity beyond the immediate requirements of Central Valley Project operation. Until the 1960's, the political voice of the Delta, a predominately agricultural area, was primarily that of Contra Costa County commercial and industrial interests. Only recently have agricultural water users played a significant role in determining Delta water policy. In the late 1960's, environmental considerations involving the use of

water for fish and wildlife protection became increasingly significant determinants of water policy in the Delta. (Snyder-California, Davis)
W77-10101

IMPROVED LOCAL PLANNING FOR RESERVOIR-ORIENTED RECREATION OPPORTUNITIES,
Illinois Univ. at Urban-Champaign. Dept. of Forestry.
For primary bibliographic entry see Field 6B.
W77-10102

PROCEEDINGS: WORKSHOP ON NON-POINT SOURCES OF WATER POLLUTION.
Illinois Univ. at Urbana-Champaign. Coll. of Agriculture; and Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W77-10159

IMPACT OF LEGAL CONSTRAINTS ON GROUND-WATER RESOURCE DEVELOPMENT IN IDAHO,
Idaho Univ., Moscow. Dept. of Civil Engineering.
D. R. Ralston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 610, Price codes: A07 in paper copy, A01 in microfiche. Ph.D. Thesis, September 1974. 131 p, 21 fig, 1 tab, 35 ref. OWRT B-019-IDA(4) and B-031-IDA(3). 14-31-001-3578 and 4076.

Descriptors: *Groundwater, Planning, Legal aspects, Economics, *Idaho, Fumping, Natural recharge, Management, Model studies, *Administration.
Identifiers: *Raft River Valley(Idaho), *Legal constraints, Pumping lift.

Groundwater management in Idaho is based on the appropriation doctrine of water law. An analysis is presented of possible administrative actions utilizing a mathematical model of a selected water resource system. According to the Idaho Code, groundwater administration is outlined by (1) selection of the management tool, (2) definition of the concept, (3) selection of the size of the administrative units and the length of the administrative period, (4) selection of the reasonable pumping lift or recharge value or values for each administrative area and (5) application of the selected value to junior users within the administrative area. Operation of a mathematical model of the water resource system in the Raft River Basin indicated that senior users at the pumping levels benefited little from closure of juniors under any management schemes. It was concluded that effective groundwater management might occur in Idaho through administrative definitions involving the concepts of reasonable groundwater pumping levels and reasonably anticipated average rate of future natural recharge. (See also W75-02981)
W77-10173

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED STATES.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 127 p, 17 fig, 27 tab, 15 ref.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Regulation, *Water policy, Water pollution control, Water quality standards, Project planning, Water resources, Financing, Industrial wastes, Municipal wastes, Sewage treatment, *United States.

Water management in the United States is handled by hundreds of organizations. No defined form, channel of communication, or co-ordination has been established. Federal participation has resulted from various legislative imperatives such as the Water Resources Planning Act of 1965, the Clean Waters Restoration Act of 1966, the 1961 Federal Water Pollution control Acts, and the 1972 Federal Water Pollution Control Act Amendments. This legislation has established institutions such as the Water Resources Council and the state-federal River Basin Commissions. In other instances, federal agencies have been given control or influence orver water quality standards, pollution control, and waste treatment facilities. Among these agencies are the EPA, Army Corps of Engineers, and the Bureau of Reclamation. The states have their own version of several of these federal laws and agencies. Interstate regional commissions or agencies also play an important part in the planning process. Federal standards have been used as guidelines for the establishment of state standards. Since most water projects require partial or total federal funding, there is an economic impetus for state and local authorities, as well as industrial establishments, to comply with federal guidelines or standards. Industrial compliance can be controlled by fines for polluters. On an international level, the United States participates in joint commissions with Canada and Mexico. (Collins-FIRL)
W77-10357

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN THE UNITED KINGDOM.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 41 p, 3 fig, 3 tab, 16 ref.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Regulation, *Water policy, Water pollution control, Financing, Water rates, Water quality standards, Water resources, Industrial wastes, Municipal wastes, Sewage treatment.
Identifiers: *United Kingdom.

Water management in England, Wales, and Scotland is reviewed. Scottish organization and practices often vary from those of England and Wales. The English and Welsh system was reorganized in 1974 to condolidate administrative and control practices. Nine English Water Authorities and the Welsh National Water Authority were formed. These agencies have separate divisions responsible for water resources conservation and development, sewerage, sewage disposal, and pollution control. Other structures of this program include the Water Research Centre, National Water Council, Water Space Amenity Commission, Central Water Planning Unit, and Water Data Unit. Scotland has developed nine regional and three island water councils. Seven river purification boards handle water pollution matters. Abstraction of surface or ground water in England and Wales is licensed, but there is no such provision under the Scottish system. English and Welsh financing results from water charges levied on licensed abstractors; payments from municipal, individual, and industrial sewer usage; and government supports. Scottish operations are funded from government grants, metered supplies, and domestic or industrial water rate charges. Nearly 100% of the total population is supplied with piped water and about 80% of English and Welsh populations are connected to public sewer systems. Data are supplied on the progress of the application of water and waste effluent standards. (Collins-FIRL)
W77-10358

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN FINLAND.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 34 p, 3 append.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Regulation, *Water policy, Water pollution control, Financing, Project planning, Water resources, Industrial wastes, Municipal wastes.
Identifiers: *Finland.

An overview of the Finnish water management program is presented. The system has been based on a regulatory approach. The 1961 Water Act applies to all water functions except ownership. The administrative network is composed of the National Water Board, the Water Court, thirteen Water Districts, and three hundred Municipal Water Boards. A licensing program governs water discharge and withdrawal. The Water Court, the only source of licenses, is the technical inspection branch of the management program. Its main purpose is the integration of water management by different functions. It also encompasses water protection, water main and sewerage expansion, expansion of recreational water uses, and water and water use supervision. Water districts have the responsibility of inspecting and measuring waterway flow rates and quality, inspecting local communities, and offering planning assistance. Municipal Water Boards, independent of national authorities, are empowered to grant licenses for small local operations and to settle simple disputes. Several sources are available for financing water management programs. Loans from the state Post Office Savings' Bank are provided for water supply and sewer systems. Water pollution control subsidies have been set aside for community assistance. The state also operates several water pollution facilities of its own. Investment loans available from the state can be applied to industrial programs. Municipalities have been able to collect sewer connection and operation charges since 1974. Their effects have not been evaluated. (Collins-FIRL)
W77-10359

STUDY ON ECONOMIC AND POLICY INSTRUMENTS FOR WATER MANAGEMENT. WATER MANAGEMENT IN JAPAN.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
1976. 49 p, 26 append.

Descriptors: *Water management(Applied), *Administration, *Legislation, *Water pollution control, Water policy, Water supply development, Industrial wastes, Municipal wastes, Project planning, Water resources, Waste water treatment, Financing.
Identifiers: *Japan.

This report deals with Japanese water management programs. No comprehensive system of water management has been developed in Japan. The nation's water management efforts have resulted from the requirements of various water supply, water pollution control, and waste treatment laws and from the regulation of surface water usage. Such laws include the River Law, the Water Pollution Law, and the Sewerage Law. Many laws regarding industrial regulation have also been influential. Institutional structures of these programs are bi-level. Prefectural Governors are empowered to determine prefectural standards for effluent and area environmental quality and to control water areas under their jurisdiction. Physical data on Japanese water resources and the economics of financing management programs are reviewed. (Collins-FIRL)
W77-10360

A NEW CODE FOR REDUCING STREAM SILTATION,
Environment Protection Authority, Melbourne (Australia).
For primary bibliographic entry see Field 4D.
W77-10369

VARIATIONS IN EFFLUENT QUALITY AND THE IMPLICATIONS FOR SETTING EFFLUENT STANDARDS,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-10371

WATER RIGHTS, CONSERVATION AND RECREATION PLANNING,
Illinois Dept. of Conservation, Springfield.
D. L. Erickson, D. L. Groves, and H. Kahalas.
Long Range Planning, Vol 8, p 75-79, February 1975.

Descriptors: *Illinois, *Land use, *Public access, *Riparian rights, *Recreation, Precriptive rights, Access routes, Water law, Ownership of beds, Navigable waters, Water rights, Riparian waters, Riparian land, Streambeds, Non-navigable waters, Public rights, Water pollution, Silting, Sewage, Waste water(Pollution).
Identifiers: *Water rights(Non-riparians), *Water resource management.

The orderly development of land resources requires a coordinated effort among national, state, and local land use planning activities. Planning thus far has been generally fragmentary in nature and has lacked the interrelationship of separate elements into a total system. The states possess ultimate land use control authority but have failed to exercise it effectively. This paper explores the feasibility of adopting land use policies in Illinois. The water resources goals of the Illinois Department of Conservation are twofold: (1) to preserve, restore, and enhance the ecological and aesthetic values of lakes, rivers, and streams in Illinois, and (2) to provide quality water-related outdoor recreation opportunities without undue degradation of ecological and aesthetic values. Water rights in Illinois are determined by four basic legal concepts: (1) riparian ownership of the land; (2) navigability of streams and rivers; (3) meandered lakes; and (4) prescriptive rights. The interrelationship of these concepts determines public access rights for recreation in waterbodies. Resource use constraints caused by municipal and industrial pollution are discussed. Alternative solutions to the public access problem are presented and evaluated. These include: (1) revision of riparian land; (2) expansion of the criteria for determining 'navigable waters' to include recreation watercraft; and (3) purchase of water rights. (Quarles-Florida)
W77-10445

THE PUSH TO EASE WATER RULES.
Business Week, p 69, 72, March 21, 1977.

Descriptors: Federal Water Pollution Control Act, *Industrial wastes, *Municipal wastes, *Regulation, *Construction costs, Administrative agencies, Government finance, Standards, Water pollution, Legislation, Legal aspects, Water law, Planning, Water policy, Water pollution control, Economics, Financing, Costs, Sewage treatment, Industries.
Identifiers: *Congressional hearings, *Federal Water Pollution Control Act Amendments of 1972, Effluent guidelines, Environmental policy, Administrative regulations.

Complying with the 1977 deadline of the Federal Water Pollution Control Act of 1972 is creating problems for both industry and municipalities. According to industry spokesmen, the majority of the steel and twenty percent of the electric utility industry will be in violation of the law when the July 1, 1977 deadline arrives. Industry's big hope is that it can get the 1977 deadline postponed to 1982, with a tacit agreement to drop 1983 standards entirely. Municipal sanitation and sewage departments are facing similar problems. Red tape and rising costs have depleted Environmental Protection Agency funds in most states, leaving clean up projects stranded. The cities have responded by pleading with Congress for more funds. The cities claim that more funds not only will help clean up the environment, but will provide more jobs. At present, it is unlikely that Congress will be sympathetic to the problems of industry. Municipalities, on the other hand, may fare better. High unemployment, growing municipal fiscal problems, and the worsening drought in the West have all served to predispose Congress to attend quickly to municipal concerns. (Stadler-Florida)
W77-10446

CHICAGO CLEANUP: INDUSTRY OUTDOES THE CITY.
Business Week, p 71, 74, July 12, 1976.

Descriptors: *Rainfall-runoff relationships, *Interceptor sewers, *Water pollution sources, *Sewage effluents, Municipal wastes, Industrial wastes, Water pollution, Pollutants, Waste water(Pollution), Wastes, Water quality, Water treatment, Water pollution control, Industrial plants, Industries, Reservoirs, Waste water treatment, Overflow, Effluents, Sewage.
Identifiers: Environmental policy, *Calumet River(Ill), Effluent guidelines.

The city of Chicago in an attempt to clean up the Calumet River has forced industry along the river to comply with Illinois' effluent discharge standards. In response to legal actions brought by the city sanitation department, the four major steel mills have invested over one hundred million dollars in advanced waste water treatment systems. This investment has significantly reduced the amount of pollution flowing into the Calumet River. The river, however, is far from clean. The major source of pollution now is raw sewage dumped by the city sanitation system. This dumping is caused by overtaxed sewers coupled with overflow problems. During periods of moderately heavy rainfall, interceptor pipes are designed to siphon off sewage before it reaches the river overflow. To solve this problem, the city is seeking federal and state aid to build a deep tunnel system which would serve as an underground reservoir. This reservoir would catch and hold sewage overflow until it can be pumped back to the original interceptor sewers. Environmental Protection Agency officials predict that the system will cost between 4.5 and 5 billion dollars. Presently, neither the city nor the federal government is willing to make the investment. (Stadler-Florida)
W77-10447

LAW OF SEA: NEW AND LASTING THEORIES, CONCEPTS PRODUCED IN LAST EIGHT YEARS,
Law of the Sea Conference, New York.
B. Zuleta.
United Nations Monthly Chronicle, Vol 12, p 48-51, July-December, 1975.

Descriptors: *United Nations, *Conferences, *Law of the sea, *Ownership of beds, Oceans, Legal aspects, Water law, International commissions, International law, International waters, Continental shelf, International Bound and Water Comm, Organizations, Foreign countries, Governments.
Identifiers: *Law of the Sea Conference, *International agreements, *Marine resources, Marine ecosystem, Marine environment, Navigability, Outer continental shelf, Territorial seas(Jurisdiction), Territorial waters, Water rights(Non-riparians), Seabed mining.

The process by which the Third United Nations Conference on the Law of the Sea arrived at new and lasting legal theories regarding the uses of the oceans is summarized. The process began in 1967 with the realization by the General Assembly that existing theories were inadequate and outdated. The Third Conference consisted of three sessions, one each in New York, Caracas, and Geneva. The Conference resulted in a single, informal negotiating text containing 324 draft articles covering, inter alia; basic conditions of exploration and exploitation (of the international area); establishment of the International Sea-Bed Authority; territorial sea and contiguous zone; straits used for international navigation; exclusive economic zone; continental shelf; high seas; rules pertaining to landlocked states; archipelagos; regime of islands; enclosed and semi-enclosed seas; rules pertaining to territories under occupation or colonial domination; protection and preservation of the marine environment, marine scientific research; development and transfer of technology. THe text represents a significant advancement in the process of making the law of the sea, and by far exceeds the expectations of the participants. (Brightman-Florida)
W77-10448

CONFERENCE ON LAW OF SEA WILL SEEK TO REACH ACCORD ON HOST OF COMPLEX ISSUES.
United Nations Monthly Chronicle, Vol 12, p 57-61, January--June, 1975.

Descriptors: *Law of the sea, *United Nations, *International waters, Foreign waters, Foreign trade, International law, Navigation, Oceans, Commercial fishing, Fish, Conservation, Continental shelf, Exploration, Exploitation, Mineralogy, Manganese, Legal aspects.
Identifiers: *Law of the Sea Conference, *Territorial seas(Jurisdiction), International agreements, Seabed mining.

The Third United Nations Conference on the Law of the Sea held its second session in Caracas in an attempt to settle questions of the breadth of the territorial sea and fishing limits. The Conference worked under the concept that exploration and exploitation of the sea's resources should be undertaken for the benefit of all mankind. Areas of study were divided among three major committees. The first attempted to diagram an international authority over sea exploration and exploitation. The second committee dealing with territorial jurisdiction appeared to reach a compromise on a twelve mile territorial sea and an exclusive economic zone up to a maximum distance of 200 miles. The third group was concerned about the obligations of States to protect the marine environment from pollution. The President of the Conference stated that a choice must be made between an international sea-bed authority with comprehensive powers and an authority restricted to regulation and exploitation of the sea-bed resources. (Quarles-Florida)
W77-10449

PUBLIC LAW ALLOWS MITIGATION OF SHORE EROSION DAMAGE BY CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Construction Operations Div.
F. Linney.
Shore and Beach, Vol 44, No 3, p 5, 7, October 1976.

Descriptors: *Coastal engineering, *Beach erosion, *Shore protection, *Rivers and Harbors Act, Damages, Legislation, Federal jurisdiction, Constitutional law, Shores, Ocean currents, Littoral drift, Coastal structures, Accelerated erosion, Projects, Erosion, Erosion control, Navigable waters, Great Lakes, Harbors.
Identifiers: *Environmental impact statement, *Coastal waters, Environmental policy, Liability.

U. S. Army Corps of Engineers studies have confirmed that federal navigation works significantly alter the littoral currents actively flowing along the shorelines of the oceans and the Great Lakes. This alteration results in acceleration erosion of the shore and beach areas adjacent to these navigation works. Even though the federal government is not

constitutionally liable for erosion damages, the Rivers and Harbors Act of 1968 authorizes the Corps to take measures to mitigate such erosion. The initial cost of projects under this Act can not exceed $1,000,000 unless specific authorization is obtained from Congress. A state or private party can allege damages by filing a report with the Corps. Such reports have to show federal responsibility for damage, the area affected, and the amount of beach erosion attributable to federal navigation works. After Corps review of the complaint, a detailed study of the most practical and economic means for correcting the damage is undertaken. Upon receipt of administrative approval, an environmental impact statement is filed and funds are appropriated. Construction can then begin. At present the Great Lakes region has received the most attention from the Corps. (Cocheu-Florida)
W77-10450

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS,
For primary bibliographic entry see Field 6F.
W77-10451

THE EFFLUENT LIMITATIONS CONTROVERSY: WILL CARELESS DRAFTMANSHIP FOIL THE OBJECTIVE OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-10452

THE MCCARREN AMENDMENT AND INDIAN TRIBES' RESERVED WATER RIGHTS,
E. McCallister.
American Indian Law Review, Vol 4, p 303-10, Winter 1976.

Descriptors: *Water rights, *Indian reservations, *Reservation doctrine, *Federal-state water rights conflicts, Federal jurisdiction, Legal aspects, State jurisdiction, Judicial decisions, Water allocation(Policy), Colorado, Water districts, Priorities, Legal review, Water law, Adjudication procedure, Legislation, Water requirements.
Identifiers: *Sovereign immunity.

Two 1976 Supreme Court decisions--Colorado River Water Conservation District v. United States and Akin v. United States--hold that state courts have jurisdiction over reserved water rights for Indian tribes. Past doctrine had held that sovereign immunity protected the United States, as trustee for the Indians' rights, from suits to determine any of its water rights. This note examines the McCarren Amendment and other case law that played a part in the landmark decisions. It also explores the possible adverse effects that these decisions may have on the adjudication of Indian tribes' reserved water rights, in view of a tradition of controversy between state officials and Indians over such rights. The state courts will have to consider federal and state law in the allocation, through quantification, of the Indians' reserved water rights. The author concludes that state courts should be granted jurisdiction only if they will use the criteria for quantification established in the case law (cited in the article) which provide for the allocation to be irreducible but allow increase where warranted by future variations in need. (Jones-Florida)
W77-10453

THE SUPREME COURT INTERPRETS THE ROLE OF THE ENVIRONMENTAL PROTECTION AGENCY IN REGULATING RADIOACTIVE MATERIALS,
K. M. Rhoades.
Washburn Law Journal, Vol 16, No 2, p 516-22, Winter 1977.

Descriptors: Federal Water Pollution Control Act, *Pollution abatement, *Radioactive waste disposal, *Environmental effects, Effluents, Discharge(Water), Wastes, Water pollution sources, Water pollution, Nuclear wastes, Radioactive wastes, Water quality control, Water quality standards, Water law, Judicial decisions, Legal aspects, Legislation, Regulation.
Identifiers: *Effluent limitations, *Radioactive pollution, *Federal Water Pollution Control Act Amendments of 1972, Administrative regulations, Effluent guidelines.

This case comment focuses on a recent Supreme Court decision which made the Atomic Energy Commission (AEC) responsible for regulating the discharge of radioactive wastes into navigable waters. Although the Federal Water Pollution Control Act Amendments of 1972 gave the Environmental Protection Agency (EPA) the power to completely eliminate the discharge of pollutants into navigable waters by 1985, the Supreme Court held that the term 'pollutants' does not include those radioactive materials covered by the Atomic Energy Act. Allowing the AEC to retain its exclusive authority over radiation standards has been criticized because the AEC, prior to its recent division into two agencies, had potentially conflicting responsibilities to fulfill: to increase the use of atomic energy and to make such use safe. Despite the AEC's recent division, the author still feels that it would be more beneficial to have a separate government agency, such as the EPA, keep the atomic energy agencies in check. Therefore the Congress should delegate the power to regulate radioactive wastes to the EPA thus curing the conflict between the policy of clean water and the development of atomic energy. (Jones-Florida)
W77-10455

DEEPWATER PORT ACT OF 1974: SOME INTERNATIONAL AND ENVIRONMENTAL IMPLICATIONS,
J. H. Gnann, Jr.
Georgia Journal of International and Comparative Law, Vol 6, No 2, p 535-63, Summer 1976.

Descriptors: *Harbors, *Ships, *Oil industry, *Foreign trade, Structures, Law of the sea, International law, Oil pollution, Oil spills, Import, Transportation, Economic efficiency, United States, Environmental effects, State jurisdiction, Federal jurisdiction, Water law, Legal aspects, Legislation, Regulation.
Identifiers: *International agreements, Licenses, Liability, Supertankers, Territorial seas(Jurisdiction), Environmental impact statement, Hazardous substances(Pollution), Deep Water Port Act of 1974, Environmental Protection Agency, Marine environment.

The Deepwater Port Act of 1974 (Act) established procedures for the location, construction, and operation of deepwater ports off the coasts of the United States to encourage the trade of oil via supertankers. Various provisions of the Act including licensing procedures required for construction, the scope of administrative powers vested in the Secretary of Transportation enforcement procedures, and state input are discussed in this note. Two aspects of the Act are discussed in detail; (1) the legality under international law of authorizing construction of artificial structures on the high seas--such ports are subject to exclusive United States control though located 20 miles or more outside of the territorial limits; and (2) the inherent environmental consequences of encouraging supertankers in American waters--the Act provides for continuous government surveillance coupled with comprehensive civil liability. The author's evaluation of the Act is that it is an ambitious attempt to grapple with a wide range of anticipated problems in a novel area through a format which emphasizes pre-planning. Congress's attempt to balance the needs of present and future generations is favorably viewed. (Jones-Florida)
W77-10456

THE GEORGIA FORESHORE AND STATE V ASHMORE: THE LEGISLATIVE GIVETH AND THE JUDICIARY TAKETH AWAY,
Emory Univ., Atlanta, Ga. Lamar School of Law.
R. E. Richards.
Environmental Law, Vol 7, No 1, p 153-79, Fall 1976.

Descriptors: *Georgia, *Boundaries(Property), *Eminent domain, *Coastal marshes, Public access, Coasts, Water law, Shores, Wildlife conservation, Tidal waters, Adjacent land owners, Tidal marshes, Common law, High water mark, Low water mark, Marshes, Legal aspects, Easements, Judicial decisions, Legislation.
Identifiers: *Property interests, *Public trust doctrine, *Real property law, Coastal Marshlands Protection Act of 1970, Foreshore.

An early (1902) act of the Georgia legislature as well as a subsequent constitutional amendment in 1945 appear to extend title to land adjacent to navigable tidewaters in private landowners as far as the low water mark. Under English common law followed up to that time, private ownership extended only to the high water mark. In the Ashmore case, the court had to settle a title dispute over certain accreted beach property. The court chose to construe the earlier legislative acts as grants of rights rather than title. The author traces the history of tideland ownership from the Engligh common law through legislative acts and court decisions in Georgia to conclude that the court's decision in the Ashmore case was contrived. When the 1902 Act was passed, the marshes were considered to be of little value; but today such property is considered biologically critical and irreplaceable. Therefore, public pressure in favor of marsh and beach preservation may have been a factor in this decision. Ordinarily, the state does not have the power to take private property without compensation, but by this decision the court has, in the author's opinion, done indirectly what the legislature could not do directly. (Jones-Florida)
W77-10457

GROUND WATERS: ARE THEY BENEATH THE REACH OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-10458

THE APPLICATION OF SURFACE WATER RULES IN URBAN AREAS,
C. E. Bridges.
Missouri Law Review, Vol 42, No 1, p 76-99, Winter 1977.

Descriptors: *Surface waters, *Surface drainage, *Urban runoff, *Alteration of flow, Water rights, Drainage, Urban drainage, Runoff, Surface runoff, Reasonable use, Legal aspects, Drainage effects, Land management, Land use, Land development, Urbanization, Relative rights, Diversion, Natural flow doctrine.
Identifiers: *Common enemy rule, *Liability, Water rights(Non-riparian), Property interests, Civil rule of surface water, Reasonable use rule.

Three rules govern surface water runoff: the civil rule, the common enemy rule, and the reasonable use rule. The civil rule holds that a landowner who interferes with the natural flow of surface waters is liable for any injury caused to other landowners. The common enemy rule basically states that each landowner has an unqualified and unlimited right to deal with the surface water on his land as he sees fit. In the reasonable use rule, a landowner's liability turns on a determination of the reasonableness of his action. All three rules have been used in urban areas and both the civil rule and common enemy rule have been modified to make them more workable for urban problems. The common enemy rule seems the least suited for use in urban areas because it ignores the impact of one landowner's action on another's property. The

civil rule, although it has not hindered development in urban areas, lacks flexibility because any alteration of flow could subject a landowner to liability. Of the three, the reasonable use rule seems best suited to urban needs because it defines reasonableness in light of the facts of each case. (Petruff-Florida)
W77-10459

JURISDICTION OVER THE SEABED: PERSISTENT FEDERAL-STATE CONFLICT,
J. C. Barrett.
Urban Law Annual, Vol 12, p 291-300, 1976.

Descriptors: *Ownership of beds, *Submerged Lands Act, *Continental shelf, *State jurisdiction, *Federal jurisdiction, Oceans, Boundary disputes, Constitutional law, Low water mark, Legal aspects, Water law, Water rights, Beds under water, Governmental interrelations, Judicial decisions, Coasts, Resources.
Identifiers: *Seabed mining, *Territorial seas(Jurisdiction), Marine resources, Territorial waters.

The latest Supreme Court decision on seabed jurisdiction establishes that the United States, to the exclusion of individual states, has sovereign rights to the seabeds lying beyond the three mile limit. Federal jurisdiction extends to the outer edge of the continental shelf. The three mile limit, demarcating state from federal jurisdiction, is measured from a baseline determined by the mean low water mark or the outer edge of inland waters. Because the federal government and the states disagree on the delineation of inland waters, and since coastlines may shift due to geological change, the establishment of baselines is subject to dispute. Therefore, although the recent Supreme Court holding appears to settle the issue of federal versus state jurisdiction of the continental shelf, it does not eliminate the possibility of seabed conflict. Disagreements may occur over geographical, technological, and political limits of jurisdiction. The author feels that rapid advancement of marine technology coupled with the slow pace of legal development leaves a gap between the law which governs the continental shelf and efforts to discover and utilize its resources. As an alternative to the legal process he recommends accommodation through political processes. (Chocheu-Florida)
W77-10460

WETLANDS REGULATION: THE TAKING PROBLEM AND PRIVATE PROPERTY INTERESTS,
G. R. Garretson.
Urban Law Annual, Vol 12, p 301-10, 1976.

Descriptors: *Eminent domain, *New Hampshire, *Wetlands, *Marsh management, *Coastal marshes, Salt marshes, Tidal marshes, Judicial decisions, Marshes, Constitutional law, Public rights, Water law, Maine, Flood plain zoning, Property values, State governments, Regulation, Zoning, Coasts.
Identifiers: *Property interests, *State policy, *Coastal waters, Fill permits, Nuisance, Property, Environmental policy.

An increase in state regulation of commercial wetland development has resulted in conflict between state agencies and private owners. These conflicts have resulted in litigation concerning whether state regulation of salt marshes can constitute a taking of property. The New Hampshire Supreme Court resolved the issue by adopting a balancing test which weighed the relative interest of the state in preventing public harm against the interests of private owners in making profitable use of their land. The Maine Supreme Court adopted a diminution of value test, a test expressly rejected by the New Hampshire court. This test states that an unconstitutional taking occurs when regulations deprive the landowner of practically all the value of the property. The author found both tests inadequate. Using the value of property as the sole criterion for wetland regulation was considered too narrow and using public harm as the standard for such regulation could discourage private development by designating previously acceptable activity as harmful. Because alternative compromise solutions can better balance competing interests, the author feels that states should use the power of eminent domain and zoning only as last resorts in wetland regulation. (Cocheu-Florida)
W77-10461

PUBLIC ACCESS TO RECEDING BEACHES,
M. Ratliff.
Houston Law Review, Vol 13, No 5, p 984-1015, July 1976.

Descriptors: *Beach erosion, *Easements, *Public access, *Erosion, Recreation, Legal aspects, Water rights, Water law, Land management, Recreation facilities, Seashores, Shores, Prescriptive rights, Erosion rates, Subsidence, Waves(Water), Texas, Beaches.
Identifiers: *Rolling easement, Public trust doctrine, Dedication.

The designation of a land mass as a beach does not assure public access to it since areas landward of high tide are subject to private ownership. As ocean waters encroach higher upon the land mass, the public's easement rights to the beach are being washed out to sea. Several major legal theories have been adopted to provide for public use and enjoyment of the beach. These theories include the public trust doctrine, prescription, dedication and custom. A serious problem exists, however, in determining exactly where the beach lies. Constant changes in the land-water interface through processes of erosion, subsidence and a rise in sea level create a number of public use–private ownership conflicts. The most feasible method of preserving public beach rights with the least loss to the landowners occurs with the application of a rolling easement. With this concept, the right to the easement moves with the line of vegetation as it recedes in conjunction to the shoreline. Such easements will always allow the beach the mean low tide and the line of vegetation to be reserved for the public regardless of the cause for the recession of the beach. (Rieck-Florida)
W77-10462

WATERS OF THE UNITED STATES: DOES FEDERAL CONTROL INUNDATE THE WETLAND (COMMENT ON US V HOLLAND),
M. C. Austin.
University of Florida Law Review, Vol 26, No 4, p 893-99, Summer 1974.

Descriptors: *Florida, *Federal Water Pollution Control Act, *Wetlands, Navigable waters, *Federal jurisdiction, Rivers and Harbors Act, Artificial watercourses, Non-navigable waters, Standards, Permits, Pollutants, Water pollution control, Water quality control, Landfills.
Identifiers: *Interstate commerce, Fill operations, *Fill permits.

Defendant developer began fill operations without a permit on a Florida wetland tract that was interlaced with nonnavigable artificial mosquito canals. Generally, fill permits are required by the Federal Water Pollution Control Act of 1972 (FWPCA) and the Rivers and Harbors Act of 1899 for all navigable waters. The federal government obtained a preliminary injunction against defendant and initiated a suit under FWPCA. The issue arising from this case, U. S. v. Holland is whether federal jurisdiction extends to all waters of the U. S. affected by interstate commerce without regard to their navigability. The court held that it did; therefore, defendant's fill activity required a permit under FWPCA. Before Holland, the term 'waters' was construed under the Act to cover only navigable waters. Now, the term encompasses 'all waters of the United States' in that even nonnavigable mosquito canals and mangrove wetlands were deemed capable of conveying pollutants into a navigable bay. However, even though Holland has effectively overruled the navigability standard, the FWPCA still cannot extend protection to waters having no effect on interstate commerce. (Denker-Florida)
W77-10463

USE OF THE COMMERCE CLAUSE TO INVALIDATE ANTI-PHOSPHATE LEGISLATION: WILL IT WASH. (SOAP AND DETERGENT ASSOCIATION V CHICAGO).
University of Colorado Law Review, Vol 45, No 4, p 487-500 (Summer 1974). 89 ref.

Descriptors: *Lake Michigan, *Michigan, *Constitutional law, *Common law, *Phosphates, *Phosphorus compounds, Pollution abatement, Environmental control, Environmental effects, Chemical wastes, Water pollution sources, Nutrient removal, Chemicals, Detergents, Domestic wastes, Soaps, Water pollution, Foam fractionation, Surfactants.
Identifiers: Commerce clause, Interstate commerce.

In the case of Soap and Detergent Association v. Chicago, the District Court for Northern Illinois held that the city ordinance, making it a criminal offense to sell detergents containing phosphorus within the city, was an unjustified interference with interstate commerce, and was thus violative of the commerce clause of the Constitution. The burden of justifying the ordinance fell upon the city, and Chicago failed to carry that burden. The court found the phosphate pollution in Lake Michigan attributable to the city to be so negligible as not to be sufficient justification for the ordinance. The author evaluates the court's reasoning, and contends that the court failed to analyze the existing case law and consequently used a decision making process the validity of which is doubtful. The author utilizes commerce-clause case law to justify a different result in the instant case, as well as discounting the precedents the court used to formulate its analysis, especially its use of a balancing test. The author further suggests that the court misunderstood the nature of the burden placed on interstate commerce, including the predicted increase costs of manufacture and distribution. The article urges a reexamination of the commerce-clause and its potential as an instrument for environmental protection. (Welch-Florida)
W77-10464

FLORIDA'S LAND USE RESTRICTIONS: ARE THEY SERVING THE PUBLIC INTEREST,
K. H. MacKay, Jr.
Fla Environmental and Urban Issues, Vol 111, No 3, p 1-3, 13-15 (February 1976).

Descriptors: *Florida, *Legislation, *City planning, *Comprehensive planning, *Local governments, Future planning(Projected), Long-term planning, Administration, Coordination, Forecasting, Governments, Regional development, Social aspects, Governmental interrelations, Legal aspects, Political aspects, Zoning, Building codes, Planning, Land use.
Identifiers: Impact fees, 1975 Local Government Comprehensive Planning Act, Program evaluation, Legislative growth policy resolution.

The basic policy underlying Florida land-use statutes is that regulation, implementation, and enforcement should be the responsibility of local authorities with state preemption only in the event of overriding state interests. With the passage of the New Communities Act in 1975 local authorities were delegated broad legislative powers. Despite active use of these legislative powers by state and local government in the past several years, serious questions have arisen as to whether these laws

even address themselves to the problems of the next decade. The Local Government Comprehensive Planning Act is plagued by lack of a coordinating mechanism and lack of funding; it may well create a greater problem in fragmentation and overlap than anticipated. The disparity in local awareness of planning needs, the lack of agreement on how to measure the costs of growth, and the effects on local government of rapid growth are illustrative of problems yet to be resolved by legislative pronouncement. The truly difficult questions, those involving fundamental value judgments, have not been answered, but must be in the near future. (Moorhouse-Florida)
W77-10465

FEDERAL AND FLORIDA LAW CONCERNING OIL POLLUTION,
Florida Univ., Gainesville. School of Law.
D. S. Swan.
Available from Eastern Water Law Center, University of Florida, Gainesville, Florida, 32611. $1.80. Water Law Seminar, Spring 1970, 25 p.

Descriptors: *Maine, *Oil pollution, *Legislation, *Rivers and Harbors Act, Judicial decisions, Administration, Common law, Remedies, Reasonable use, Trespass, Oil spills, Legal aspects, Water pollution, Water law, Oil, Water pollution sources, Oil wastes, Disasters.
Identifiers: *Oil Pollution Act of 1924, Water Quality Improvement Act of 1970.

The author contends that present federal and state legislation available to combat oil spills is ineffective. Section 411 of the Rivers and Harbors Act and the Oil Pollution Act of 1924, as amended 1966, are the major pieces of legislation which form federal protection against oil spills. Other federal acts have proven to be ineffective due to their lengthy administrative and judicial procedures. Such common law theories as the reasonable use rule of water law and remedies such as nuisance and trepass in property and tort law are alternative means to deal with pollution. Recent federal legislation entitled the Water Quality Improvement Act of 1970, an amendment to the Federal Water Pollution Control Act, seems to be a step in the right direction in the field of oil spill control. In addition to providing stricter liability, it presents plans to prevent disasters and provides for immediate effective cleanup. Another positive indication of improved future oil pollution control is the strengthening of state legislation relating to coastal conveyance of oil. For example, Maine provides a license fee to raise monies for immediate cleanup of spills. Legislation mandating stiff penalties and stricter liability is urgently needed. (Rieck-Florida)
W77-10467

WASTE HEAT UTILIZATION FROM THERMAL POWER PLANT IN NEW YORK STATE,
A. Buchwald.
Sea Grant Law Journal, Vol 1, p 211-54 (1976). 183 ref.

Descriptors: *Heated water, *Thermal pollution, *Thermal powerplants, *Coasts, *Waste water(Pollution), New York, Water cooling, Water pollution sources, Water temperature, Pollution abatement, Legislation, Jurisdiction, Federal government, State governments, Local governments, Social aspects, Agriculture, Irrigation, Aquiculture, Fish farming, Fish hatcheries, Powerplants, Electric powerplants, Governmental interrelations
Identifiers: *Coastal region, *Coastal zone management, *Coastal waters.

Traditionally waste heat on the environment has been considered thermal pollution. However, it is now possible to utilize this waste heat beneficially for aquaculture and agriculture. Such use would permit application of multiple-use principles to the coastal zone regions. Multiple-use has been encouraged by both the Federal and New York State governments. Society will experience maximum benefit as the scarce coastal zone regions will be utilized for both industrial development and environmental preservation. Multiple-use management plans would require power generating facilities to be sited with waste heat utilizing industries, such as fish hatcheries. One major problem in the realization of this goal is that jurisdiction over power plant siting, water quality standards, and coastal zone management is fragmented among federal, state, and local governments. Consolidation would greatly facilitate multiple-use plans. Aside from aquaculture, heated water is beneficial to agricultural irrigation and the heating of greenhouses in the winter. Research has also shown that sewage is treated more effectively with heated water. Both the federal government and the New York legislature have approved minor legislation on the topic. Major legislative programs are needed. A Model Statute is recommended herein highlighting the necessary changes in the existing statutory framework. (Moorhouse-Florida)
W77-10468

COASTAL ZONE MANAGEMENT INVOLVING THE BOUNDARY WATERS OF NEW YORK AND ONTARIO,
R. E. Weinberg.
Sea Grant Law Journal, Vol 1, p 255-334 (1976). 334 ref.

Descriptors: *Lake Ontario, *Lake Erie, *Resources development, *New York, *Canada, International law, Coasts, Legal aspects, Treaties, International Bound. and Water Comm., Federal government, International commissions, International joint commission, St. Lawrence River, State governments, Bank erosion, Water law, Water rights, Water resources development, Resource allocation.
Identifiers: *Coastal waters, *Coastal zone management, National Environmental Policy Act, Ontario, Boundaries(Water).

The 1972 Coastal Zone Management Act encompasses the waters of the Great Lakes to the limit of United States jurisdiction. Thus the coastal zone of New York extends to the international boundary running through the St. Lawrence River and Lakes Ontario and Erie. Compliance with the 1972 act requires New York to implement a comprehensive coastal zone management program. However, any plan for development of coastal zone resources will have an international impact and perhaps international legal consequences. The U. S. Canada Boundary Water Treaty of 1909 created a joint commission to consider all matters pertaining to water management on the international border and provided that citizens of one country have legal rights enforceable in the courts of the other when they are injured by improper utilization of shared waters. The National Environmental Policy Act imposed further obligations to assess the impact upon Canadian interests of New York resource management proposals. As a result, a conceptual framework defining development problems in international terms is essential. The drainage basin approach is illustrated by its operation in terms of fisheries management and mineral resource development. Reciprocal legislation on the federal and state province levels is recommended as a feasible legal framework for implementation of a comprehensive international resource development program. (Moorhouse-Florida)
W77-10469

FEDERAL AND STATE CONTROLS OVER LAND/WATER DEVELOPMENT IN NAVIGABLE AND NON-NAVIGABLE WATERS,
C. G. Novack.
Sea Grant Law Journal, Vol 1, p 335-367 (1976). 156 ref.

Descriptors: *Earth-water interfaces, *Water resources development, *Governments, *Permits, Regulation, Administration, Boundary processes, Interfaces, Resources development, Comprehensive planning, Federal government, State governments, New York, Water law, Planning, Legal aspects, Water permits, Administrative agencies, Control, River and Harbor Act, Water management(Applied), Coordination, Decision making, Administrative decisions.
Identifiers: *Administrative regulations, Federal Water Pollution Control Act Amendments of 1972, Fill permits.

The framework of powers and procedures within which land/water development decisions are made is highly complex. Land/water interfaces and any changes in their character are essential elements to be considered in any development decision. The inherently complex nature of the land/water interface ecosystem further complicates attempts to efficiently and simplistically guide its development. Control over resource development in navigable waters rests primarily in the Corps of Engineers. Federal permit systems authorized by the Rivers and Harbors Act of 1899 and the Federal Water Pollution Control Act of 1972 and legislated penalties are the principle tools of Corps control. The author describes the process of permit application and approval at the federal level in detail. The state of New York has adopted a similar permit program which is administered by its Department of Environmental Conservation. New York's Environmental Conservation Law authorizes issuance of three types of permits: (1) Stream Protection Permits; (2) Tidal Wetlands Moratorium Permits; and (3) Freshwater Wetlands Interim Permits. This dual permit system is expensive and cumbersome. A more plausible solution would place the federal government in charge of all permits or alternatively provide federal support for states issuing all permits for interstate and intrastate waters. (Moorhouse-Florida)
W77-10470

OFFSHORE MINERAL RESOURCE EXPLOITATION: THE STATE AND FEDERAL RESPONSE,
J. K. Sinclair.
Sea Grant Law Journal, Vol 1, p 385-416 (1976). 181 ref.

Descriptors: *Oil reservoirs, *Continental shelf, *Oil, *Exploitation, *Shore protection, Coasts, Offshore platforms, Oil pollution, Oil spills, Oil wells, Oil industry, Resources development, Federal government, State governments, Governmental interrelations, Legislation, Water law, Legal aspects, Coordination, Leases.
Identifiers: Coastal waters, Coastal zone management, National Environmental Policy Act, Federal Water Pollution Control Act Amendments of 1972.

In view of the great need for domestic sources of oil, the President of the United States has authorized the leasing of 10 million acres on the outer continental shelf. Any such coastal exploitation has three types of impact: (1) a primary impact from the exploitation itself; (2) a secondary impact from the development of facilities ancillary to the development; and (3) a tertiary impact which occurs when the exploitation ceases. The federal government has sought to control the impact of exploitation itself primarily through the Outer Continental Shelf Lands Act. However, because of the great environmental risks of offshore drillings Atlantic Coast states are justifiably dissatisfied with the federal legislation. If the states are to bear the environmental risks for projects from which the federal government will reap the benefits, resolution is unlikely. But, if states were given title to the leased lands and received royalties from the developments they would be at least partially compensated for risks assumed. The Coastal Zone Management Act is concerned with the secondary impact of offshore development and directs states to preserve and protect shoreline areas. In so doing, the act fails to

acknowledge the socioeconomic effects of secondary development necessitated by offshore drilling. Furthermore, neither states nor the federal government have adequately studied and planned for the depletion and abandonment of facilities now being developed. Numerous legislative amendments are proposed for consideration. (Moorhouse-Florida)
W77-10471

ORGANIC CHEMICALS MANUFACTURING POINT SOURCE CATEGORY, PROPOSED EFFLUENT GUIDELINES AND STANDARDS.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-10472

APPLICATION OF PERMIT PROGRAM TO SEPARATE STORM SEWERS.
For primary bibliographic entry see Field 5G.
W77-10473

PLASTICS AND SYNTHETICS MANUFACTURING POINT SOURCE CATEGORY, EFFLUENT LIMITATIONS AND GUIDELINES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-10474

BAYLEY V KANE (ENFORCEMENT OF ORDER TO REMOVE IMPROVEMENTS HELD TO BE IN VIOLATION OF FLOOD CONTROL ZONES ACT).
560 P2d 1165-69 (Wash App 1977).

Descriptors: *Flood control, *Flood routing, *Flood plain zoning, *Washington, Flood protection, Flow control, River flow, Flood forecasting, Flood frequency, Channel improvement, Flood damage, Maximum probable flood, Riparian rights, Flood flow, Floods, Landfills, Permits, Bulkheads, Concrete structures.

Defendant, flood plain landowner, appealed from a judgment for plaintiffs, County and State Department of Ecology. The original suit was brought by plaintiffs seeking removal of improvements on defendant's property which were in violation of the Flood Control Zones Act. These improvements were constructed after a permit application for their construction had been denied by plaintiffs pursuant to Flood Control Zones Act. The permit was denied because the improvement plans were contrary to that act in that they would increase the flow of floodwaters expected in a one hundred year frequency flood, causing more severe flooding downstream. Defendant contended that since the statute contemplated a one hundred year flood as the standard, and increased downstream flooding as the reason, that the original removal order should be affirmed. The court agreed with the plaintiffs, and affirmed the order as modified. The court's modification provided for a more clearly defined method of abatement. (Brightman-Florida)
W77-10475

BENSON V BURGESS (SUPERIOR AND SUBORDINATE RIGHTS TO IRRIGATION WATER).
561 P2d 11-15 (Colo 1977).

Descriptors: *Preferences(Water rights), *Adjudication procedure, *Irrigation permits, *Priorities, *Prescriptive rights, Irrigation, Irrigation canals, Irrigation water, Permits, Water permits, Judicial decisions, Colorado, Water law, Water rights, Legal aspects, Prior appropriation, Water supply.

Appellants, owners of an irrigation ditch, sought review of a decree which made their water rights subordinate to those of the appellee. Appellee, owner of another irrigation ditch, obtained a decree granting him the rights to the water of the Coryell Gulch. Since the decree had an appropriation date. Appellants had a subordinate decree, which granted appellants rights to the water of Surface Creek. In 1975, appellee had the appellants' decree reviewed. The court found that the appellants' decree accordingly. On appeal, appellants asserted that the appellee had failed to file his 1975 protest pursuant to section 37-92-302(3) of the Colorado Revised Statutes. The court found, however, that appellee had shown that he was adversely affected by the previous decree, that he was excused from compliance with the three year statute of limitations, and that appellants had not obtained exclusive water rights by either adverse use, prescription, or relinquishments of water rights by other irrigation ditch owners. Accordingly, the 1975 decree was affirmed. (Stadler-Florida)
W77-10476

APPLICATION OF SANBORN (APPLICATION TO REGISTER TITLE TO LAND BELOW HIGH WATER MARK).
562 P2d 771-79 (Hawaii 1977).

Descriptors: *Hawaii, *High water mark, *Water level fluctuations, *Boundaries(Property), Water courses(Legal), Tidal waters, Tidal effects, Seashores, Fluctuations, Water levels, Tides, Erosion, Shores, Boundary disputes, Public lands, Waves(Water), Beach erosion, State governments.
Identifiers: *Submerged lands, *Property interests, Real property law, Presumptions(Legal), Public trust doctrine.

Appellant, the state land surveyor, sought reversal of a land court ruling which ordered appellant to certify a map showing appellee's (landowner) beach front property line to be below the high water mark. The property line in controversy was drawn pursuant to distances and azimuths contained in an earlier land court decree of registration. It was appellee's contention that the previous land court registration was controlling and the fact that that title placed the property line below the high water mark was due to permanent erosion. Thus, title should be determined pursuant to an exception to the general rule holding all such land in public trust. Appellant contended that there was no permanent erosion, only seasonal variation, and the annual high water mark was the criterion specified in the statute. The state supreme court, in reversing the land court's decision, held that natural monuments such as a high water mark are controlling over distances and azimuths, and that where it is proved that the distances and azimuths are not coterminous with a line reflecting the upper reaches of the wash of waves, the latter line will prevail. (Brightman-Florida)
W77-10477

VAN DEURSEN V DUNLAP TOWING COMPANY (THE RIGHT OF NAVIGATION AS PREVAILING OVER THE RIGHT TO FISH).
562 P2d 666-69 (Wash App 1977).

Descriptors: *Washington, *Navigation, *Harbors, *Negligence, Commercial shellfish, Safety, Hazards, Crabs, Navigable waters, Crustaceans, Shellfish, Aquiculture, Shellfish farming, Legal aspects, Water law, Law of the sea, Aquatic animals, Aquatic life, Trespass.
Identifiers: *Liability, *Navigation obstructions, Coastal waters, Jury instructions, Navigational servitude, Navigability, Vessels.

Defendant, owner of log tow vessels, appealed from a verdict finding him sixty percent negligent in overrunning and destroying a number of crab pots belonging to plaintiff. The crab pots were destroyed as defendant entered a bay seeking shelter from a storm. A corridor about one mile wide was provided between the crab pots to allow entry to the bay. Plaintiff contended that the right of navigation prevails over the right of fishing when the two come into conflict, and that consequently this action should have been dismissed as a matter of law. Plaintiff contended that the governing rule of law is not so strict, and the right of navigation has no authority to trespass upon the rights of fishing where the two may be enjoyed freely and fairly. The court recognized the primacy of navigation, but only where the two rights were in direct conflict and could not freely and fairly co-exist. Therefore, the appeal was not allowed. The findings of negligence in the lower court were affirmed. (Brightman-Florida)
W77-10478

WARD V COLEMAN (CONSTITUTIONALITY, AND THE CRIMINAL OR CIVIL NATURE OF FINES UNDER THE FEDERAL WATER POLLUTION CONTROL ACT).
423 F Supp 1352-59 (W D Okla 1976).

Descriptors: *Oklahoma, *Oil pollution, *Oil spills, Federal Water Pollution Control Act, Regulation, Assessments, Water law, Oil wells, Oil fields, Oil industry, Law enforcement, Water pollution control, Navigable rivers, Navigable waters, Legal aspects, Judicial decisions, Damages, Penalties(Legal), Drilling, Water pollution sources.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Hazardous substances(Pollution), Liability, Sheen test.

Defendant, owner and operator of an oil drilling site, sought summary judgment or judgment on the pleadings in a suit by plaintiff, U. S. government, to enforce a penalty levied on defendant as a result of an oil spill from defendant's drilling operation into a navigable waterway. The fine was levied pursuant to the Federal Water Pollution Control Act (FWPCA). Defendant contended that: the fine imposed was criminal in nature, and as such, the self-reporting requirement of FWPCA violated his fifth amendment protection from self-incrimination; that his rights were violated by the strict liability imposed by FWPCA; and that the 'sheen' test was not such a test as was authorized by FWPCA to determine spill magnitude. Plaintiff contended that: the fine imposed was civil in nature and therefore not violative of defendant's rights; that due process was afforded before strict liability was applied; and that the 'sheen' test was within the scope of FWPCA. The court ruled in favor of plaintiff on all three issues and denied defendant's motion for summary judgment or judgment on the pleadings. (Brightman-Florida)
W77-10479

VANDERVELDE V CITY OF GREEN LAKE (AUTHORITY OF CITY TO REQUIRE USE OF CITY WATER AND SEWER MAINS).
240 NW2d 399-403 (Wisc 1976).

Descriptors: *Municipal water, *Cities, *Sewers, *Wisconsin, *Legal review, Judicial decisions, Legislation, Local governments, Eminent domain, Condemnation, Construction, Building, Sewage disposal, Water users.
Identifiers: *Injunctive relief.

Plaintiff City of Green Lake sought to lift a court-ordered injunction that restrained it from requiring the use of city sewer and water mains under local ordinances. Defendants, property owners who were the objects of condemnation proceedings for the purposes of constructing such facilities, and who also would have been forced to use the city services, argued on several grounds that the injunction should remain. The Supreme Court reversed the trial court, stating that the city had the authority to require use of city sewer and water mains; furthermore, there were such substantial irregularities in city council proceedings as to require reversal in the interest of justice. The court's decision hinged on the interpretation of a state statute which stated that authority to compel

sewer and water use was given to towns having a population of more than 7,500. The court found that cities were not subject to such a limitation, and thus could enforce the uses even though populated by less than 7,500 people. (Frank-Florida)
W77-10480

UNITED STATES V ALLIED CHEMICAL CORPORATION (MULTIPLE-COUNT INDICTMENTS FOR WASTE DISCHARGE VIOLATIONS OF THE RIVERS AND HARBORS ACT).
420 F Supp 122-25 (E D Va 1976).

Descriptors: *Virginia, *Chemical wastes, *Discharge(Water), *Rivers and Harbors Act, Navigable waters, Damages, Chemical industry, Navigable rivers, Discharge frequency, Chemicals, Chemical degradation, Legal aspects, Rivers, Effluents, Legislation, Waste disposal, Water pollution, Pollutants, Water pollution sources, Wastes.
Identifiers: *Kepone, Tris 2-hydroxyethyl isocyanurate(THEIC), Triallyl isocyanurate(TAIC), Multiple-count indictments, *Refuse Act of 1899, Chemical compounds, River contamination, Effluent guidelines.

Defendant, a chemical manufacturing plant in Virginia, discharged industrial wastes from the production of kepone, Tris 2 - Hydroxyethyl Isocyanurate (THEIC), and Triallyl Isocyanurate (TAIC) into a branch of the James River, a navigable waterway. The defendant was charged with violations of the Refuse Act and a 456 count indictment was filed. Each day in which any of the three chemical compounds were discharged was listed as a separate count. Defendant contends that the courts were multiplicitous and the government should be required to elect a single count or in the alternative, to consolidate all counts into a single count. The court held that the determination of whether several counts charging violation of the same statute are multiplicitous is one of legislative intent and doubts should be resolve against viewing a single transaction as multiple offenses. However, the Rivers and Harbors Act is meant to punish each separate act of discharging refuse and not the discharge itself. The court could not determine until proofs had been offered whether the 456 counts were multiplicitous. (Denker-Florida)
W77-10481

HOGAN V. OLIVERA (GENERAL DAMAGES AWARD UPHELD FOR FLOOD DAMAGE TO REAL AND PERSONAL PROPERTY).
233 S.E.2d 428-33 (Ga Ct App 1977).

Descriptors: *Georgia, *Ditches, *Trespass, *Flood damage, *Compensation, Property values, Water conveyance, Construction, Surface drainage, Surface runoff, Floods, Surface waters, Water control, Water law, Legal aspects, Judicial decisions, Damages.
Identifiers: *Real property law.

Defendant's contractor, while developing a subdivision above plaintiff's lot, cut an extension ditch from the end of a drainage pipe in such a way that the water collected was discharged onto plaintiff's property. Plaintiff sued for damages, general and special, from this trepass to realty. A jury verdict which set the amount of damages due was appealed by defendant upon a claim that there was no probative evidence of certain of the special damages suffered by plaintiff. The Court of Appeals of Georgia held that since there was no showing that the jury considered illegal elements and its findings were within the range of the evidence, the judgment would not be reversed. (Jones-Florida)
W77-10482

JOUBERT V. STATE (STATE LIABLE FOR FLOOD DAMAGE TO CROPS CAUSED BY OPENING OF DAM'S FLOODGATES).
345 So2d 220-25 (La App 1977).

Descriptors: *Flood damages, *Louisiana, *Crops, *Flood control, *Compensation, Soybeans, Water management(Applied), Damages, Dams, Reservoirs, Floodgates, Legislation, Legal aspects, Adjacent landowners, Negligence, Penalties(Legal), Proprietary power, Water law, Bayous, Flooding.
Identifiers: Dam effects, Liability, Real property law, Strict liability.

Plaintiff sharecroppers in the two consolidated cases sought recovery of crop damages caused when their crops of soy beans and milo were flooded from water flowing over a state-owned dam in the neighboring state park. The trial court held that the state was responsible for the flooding by causing one of the dam floodgates to be opened following a period of heavy rains when the water level in the lake was high. Despite testimony that the land would have flooded without this action, the trial court concluded that the opening of the gates caused larger volumes to escape the reservoir and in turn flood plaintiffs' crops. The suit was based on a strict liability statute imposing upon every landowner a duty not to use his land in such a way as to deprive his neighbor of the enjoyment of his land. On appeal, to the Third Circuit Court of Appeal of Louisiana, the amount of damages allowed was reduced by the percentage of the landowner's share of the crops, but the judgment was otherwise upheld. (Jones-Florida)
W77-10483

UNITED STATES V ATLANTIC RICHFIELD COMPANY (ABSOLUTE LIABILITY FOR OIL SPILLS UNDER FEDERAL WATER POLLUTION CONTROL ACT).
429 F Supp 830-43 (E D Pa 1977).

Descriptors: Federal Water Pollution Control Act, *Penalties(Legal), *Oil spills, *Accidents, *Navigable waters, Water pollution, Water pollution sources, Water Law, Rivers and Harbors Act, Harbors, Hazards, Negligence, Constitutional law, Administrative decisions, Federal jurisdiction, Judicial decisions, Legal aspects.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Refuse Act of 1899, *Absolute liability, Administrative regulations, Coastal waters, Hazardous substances(Pollution), Liability, Vessels.

Plaintiff, the United States, sought to enforce penalties assessed, pursuant to the Federal Water Pollution Control Act (FWPCA) against defendant oil companies. Defendants had accidentally discharged oil into navigable waters. They promptly reported each spill and cleaned it up to the satisfaction of the Coast Guard. Subsequently the Coast Guard assessed penalties against the defendants pursuant to section 1321 (b)(3), (5), and (6) of the FWPCA. Defendants argued that because they had cleaned up the spills, they were not in violation of section (b)(3) which prohibited harmful discharges into navigable waters. The defendants further asserted that by subjecting an accidential, self-reporting, self-cleaning discharger to a fine under section (b)(6), the government was attempting to impose a criminal penalty contrary to the grant of immunity in section (b)(5). Plaintiff contended that remedial action initiated after a spill was irrelevant to the question of harmfulness under section (b)(3); that fault was not an element of the violation but merely a factor relevant to the administrative penalty procedure; and that the goal of section (b)(6) was to deter spills and not to punish responsible parties. The court held that penalties are proper, and that the statute bears a rational basis, that the legislative intent is clear, and that section (b)(6) is not only primitive in nature, but operates as a civil sanction. (Cocheu-Florida)
W77-10484

UNITED FAMILY FARMERS V KLEPPE (INITIAL STAGES OF RECLAMATION PROJECTS POSSIBLE BEFORE RECORDABLE CONTRACTS ARE EXECUTED).
552 F2d 823-28 (8th Cir 1977).

Descriptors: *South Dakota, *Reclamation, *Contracts, Water resources development, Legislation, Judicial decisions, River basin development, Federal government, Water law, Administrative agencies, Legal aspects, Dams, Rivers, Project purposes, Decision making, Damsites, Diversion structures, Farms, River basins, Diversion, Projects, Missouri River.
Identifiers: *Reclamation Extension Act of 1914, *Omnibus Adjustment Act of 1926, *Missouri River Basin Project, *Oahe Dam, Injunctive relief, Private interest groups, Property interests.

Plaintiff, a non-profit South Dakota Corporation, sought injunctive relief against the United States Secretary of the Interior to halt construction of the initial stage of the Oahe Diversion Unit of the Missouri River Basin Project. Plaintiffs cited the secretary's failure to comply with section 12 of the Reclamation Extension Act of 1914 as grounds for relief. The Act required all excess land owners to have executed recordable contracts for sale 'before any contract is lt or work begun'. The District Court for the Southern District of South Dakota granted summary judgment for the defendant and the Court of Appeals for the Eighth Circuit affirmed. After extensive review of relevant statutory history, the courts found that section 46 of the Omnibus Adjustment Act of 1926 had superseded section 12 of the Reclamation Extension Act of 1914 for projects built after 1926. Section 46 of the Omnibus Adjustment Act was interpreted as allowing construction to proceed even though all excess land owners had not executed recordable contracts, but prohibiting delivery of water to any excess land until a contract for its sale was executed. (Moorhouse-Florida)
W77-10485

STATE V WILSON (SEASONALLY FLOWING STREAM NOT CONSTANTLY FLOWING STREAM).
562 P2d 172-75 (Ore 1977).

Descriptors: *Oregon, *Streams, Flow, *Obstruction to flow, Legal aspects, Legal review, Water law, Aquatic life, Running waters, Natural streams, Streamflow, Streambeds, State governments, Legislation, Administrative agencies, Permits, Flow rates, Riparian rights, Water rights, Alteration of flow, Judicial decisions.
Identifiers: *Fill permits, *Injunctive relief, Administrative regulations.

The State, acting through the Division of State Lands, sought to enjoin defendant from filling in a portion of a creek that crossed his land. The creek was dry from June or July through October. Injunctive relief was sought pursuant to a statute prohibiting the filling of constantly flowing streams without obtaining a proper permit. The Division of State Lands, through regulation, had defined constantly flowing streams as any stream which flows during a portion of every year and supports aquatic life. The Supreme Court of Oregon denied the injunction and held the administrative regulation invalid. The court's detailed analysis of the relevant statutory history led them to conclude that the inclusion of any stream which flows during any portion of the year in the class of constantly flowing streams was clearly inconsistent with legislative intent. (Moorhouse-Florida)
W77-10486

DE SIMONE V KRAMER (ARTIFICIALLY CREATED ACCRETION SUBJECT TO LAW CONCERNING NATURAL ACCRETION).
252 NW2d 653-59 (Wis 1977).

Descriptors: *Wisconsin, *Accretion(Legal aspects), *Boundaries(Property), *Boundary

disputes, *Riparian rights, Legal aspects, Judicial decisions, Adjacent land owners, Shores, Water law, Banks, Relative rights, Remedies, Riparian land, Legal review, Penalties(Legal), Damages, Rivers, Property values, Real property, Dredging.
Identifiers: Property interests, Property, Real property law, Frontage, Deeds.

Purchasers brought an action against vendors for deed reformation. The plaintiffs alleged that the deed description based on a 1928 plat did not accurately describe the property agreed upon in the purchase and sale agreement executed by the parties. Specifically, there was an eighteen foot discrepancy in frontage. This discrepancy was caused by an enlargement of the shoreline as a result of dredging by the Army Corps of Engineers. Plaintiffs prayed that the additional frontage sould be awarded them. The defendants argued that the fill area caused by the dredging was not theirs to convey and that they relied on the pre-fill 1928 plat map in making the conveyance. The trial court ruled for the plaintiffs but granted money damages since reforming the deed would be harmful to abutting property owners. The Wisconsins Supreme Court affirmed discounting the defendant's argument that they did not own the accreted property by stating the familiar rule that alluvion formed by accretion belongs to the owner of the upland to which it is contiguous. The court held that even though the accretion in this case was caused by artificial means the rule concerning natural accretion should be applied. (Moorhouse-Florida)
W77-10487

CEED V CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION (CALIFORNIA COASTAL CONSERVATION ACT UPHELD AGAINST CONSTITUTIONAL CHALLENGE).
118 Cal Rptr 315-34 (Cal App 1974).

Descriptors: *California, *Constitutional law, *Administrative agencies, *Permits, *Regulation, *Real property, Judicial decisions, Legal aspects, Environment, Legislation, Coasts, State governments, Wetlands, Administrative decisions, Governments, Water policy, Conservation.
Identifiers: Administrative regulations, Property interests, Fill permits, Real property law, Coastal zone.

Plaintiff building associations and trade unions sought declaratory relief, challenging the constitutionality of the California Coastal Conservation Act. The Act designates a geographical conservation zone within which any person seeking to improve property must obtain a permit from a regional commission. The applicant bears the burden of proof that the development will not have a substantial adverse environmental effect. Plaintiffs alleged violations of both the United States and California constitutions, including infringement on the right to travel, unlawful taking of private property without just compensation, and denial of due process to affected property owners. The California Court of Appeals, Fourth District, held that the Act imposes no chilling effect on an individual's freedom of movement as it is not discriminatory and imposes no durational residence requirements or penalties; that the Act does not provide for permanent taking of property without just compensation; and that plaintiffs were not deprived of due process merely because the Act places the burden of proof on all issues upon the applicant for a permit. (Sloan-Florida)
W77-10488

INGRAM V CITY OF REDONDO BEACH (INVERSE CONDEMNATION SUIT RESULTING IN DAMAGES FOR FLOODING).
119 Cal Rptr 688-92 (Cal App 1975).

Descriptors: *Condemnation, *Flooding, *Flood damage, *California, *Drainage effects, Water law, Local governments, Cities, Floods, Sumps, Legal aspects, Overflow, Surface water, Damages, Percolation, Flow, Drainage systems, Flood control, Runoff, Drainage, Judicial decisions.
Identifiers: Citizen suits, Liability, Property interests, Proximate causation, Inverse condemnation.

Plaintiff landowners brought action against defendant city for water damages caused by a collapse of a retaining wall appurtenant to defendant's drainage sump. The trial court found for the defendant on the issue of liability. On appeal, the lower court found that the plaintiffs failed to establish any liability for inverse condemnation within the meaning of Article 1, Section 14 of the California Constitution. That section allows for compensation for any actual physical injury to real property which is proximately caused by deliberately designed and constructed public improvement. Previous cases had interpreted this to allow recovery if the public entity's work was a substantial cause of the injury. The lower court held that no damages to plaintiff occurred as a proximate result of the defendant's public improvement. The appellate court reversed, holding that the lower court used an incorrect principle of law with respect to causal responsibility. The collapse of the wall which released a flood onto the plaintiffs' properties could have been a substantial factor in causing the damages. Barring a finding by the lower court that the damages were the result solely of an unforeseen and intervening cause, inverse condemnation liability will result. (Petruff-Florida)
W77-10489

CRUMPTON V DEPARTMENT OF WATER RESOURCES (WATER RIGHTS CANCELLED AS A RESULT OF NONUSE).
559 P2d 927-30 (Or Ct App 1977).

Descriptors: *Oregon, *Appropriation, *Beneficial use, *Administrative agencies, *Permits, Water law, Legislation, Judicial decisions, Legal aspects, Diversion, Water rights, Irrigation, State governments, Irrigated land, Regulation, Water allocation(Policy), Irrigation water.
Identifiers: *Presumptions(Legal).

Petitioner land owners appealed an order of respondent department which cancelled certain water rights. The cancelled water rights dated from 1910 and allowed appropriation for irrigation purposes of what is now three parcels of land. The order cancelling the water rights to the entire first parcel and a portion of the second parcel was based on a state statute. The statute provides that when an owner of a water right ceases or fails to put the water to beneficial use for a period of five consecutive years, the right to use shall cease and the water right will be presumed to be abandoned. The respondent cancelled the water right upon substantiated evidence of such nonuse. This order was affirmed noncompliance with statutory proceedings which require a change of permit if a change is made in the point of diversion. The appellate court found that the respondent's findings and conclusions were insufficient to permit review. The order was remanded for entry of a more informative order. (Petruff-Florida)
W77-10490

ODOM V DELTONA CORPORATION (NONMEANDERED LAKES IN FLORIDA ARE PRESUMED TO BE NON-NAVIGABLE IN THE ABSENCE OF EVIDENCE TO THE CONTRARY).
341 So2d 977-92 (Fla Sup Ct 1977).

Descriptors: *Florida, *Navigable waters, *Nonnavigable waters, *Lakes, Riparian rights, Ownership of beds, Legal aspects, Judicial decisions, Bodies of water, Riparian waters, Swamps, State governments, Dredging, Real property, Lake shores, Lake beds, Ponds.
Identifiers: *Navigability, *Real property law, Fill permits, Navigability tests, Submerged lands, Swamp and Overflow Lands Grant Act, Sovereignty.

Plaintiff corporation sought declaratory relief against the Board of Trustees of the Internal Improvement Fund of the State of Florida. The Board had refused permission for the plaintiffs to alter certain unmeandered lakes to which plaintiffs laid claim under various chains of title; the Board's contention was that the lakes are 'the waters, beds, and shores of navigable waters' held in trust for the public by virtue of the state's sovereignty. Under federal and state common law there is no dispute as to the proposition that the beds and shores of navigable waters are held by the sovereign, but considerable litigation has arisen as to what constitutes navigability. The Supreme Court of Florida held that lakes which were not originally meandered by government surveyors and which were subsequently alienated are presumed to be non-navigable and hence the property of those to whom they had been conveyed, if the chain of title to the property falls within the provisions of the Florida Marketable Record Title Act. this presumption of non-navigability is rebuttable, however, by evidence of navigability. (Sloan-Florida)
W77-10491

APPROPRIATION OF WATER FOR USE OUTSIDE STATE.
Idaho Code Ann secs 42-401 thru -411 (1948), as amended, (Supp 1976).

Descriptors: *Water permits, *Idaho, *Appropriation, *Water distribution(Applied), *Water allocation(Policy), Water policy, Water rights, Wyoming, Nevada, Washington, Permits, Water management(Applied), *Water transfer, Interstate rivers, Interstate, State jurisdiction.

Public waters of Idaho may be appropriated for use in Oregon provided the interests of Idaho will not be harmed. The appropriation permit may be conditioned on the filing of a certificate from the receiving state showing that the intended appropriation will be used benefically. Idaho laws control the administration of water appropriations to sister states as long as the waters remain within Idaho. Appeals from agency-made permit decisions may be taken to the district court of the county in which the water at issue is located. Idaho will not authorize water appropriation to states which do not have reciprical legislation allowing appropriations into Idaho. Proof of completion of works within the sister state shall be made. Officials of the receiving state may be required to certify the completion of such works and to verify the capacity of reservoirs and conduits. Permit applications to divert and appropriate Idaho's waters into Washington are treated as if the proposed use were within Idaho. Permit applications for appropriations of Idaho's waters for domestic, livestock or irrigation uses within Nevada are also allowed as if the proposed use were within Idaho. (Josepher-Florida)
W77-10492

WATER AND LAND DEVELOPMENT (WATER RESOURCES DEVELOPMENT).
Hawaii Rev Stat secs 174-1 thru -22, 176-1 thru -9 (1968).

Descriptors: *Hawaii, *Irrigation programs, *Water resources development, *Water supply development, Comprehensive planning, Governments, State governments, Administrative agencies, Potential water supply, Water allocation(Policy), Water utilization, Economic impact, Competing uses, Legislation, Multiple-purpose projects, Municipal water, Domestic water, Water purification.

The state of Hawaii has determined that additional water and water facilities are necesary to the development of the state's economy, and has thus established the board of land and natural resources. The board is vested with the power of eminent domain to acquire water and water sources, the power to contract, and also the power to survey and conduct all studies necessary to carry out its duties. Additionally, the board is empowered to lay and collect annual acreage assessments within a project and to set and collect tools for the use of the board's water facilities. Procedures are established for the formation of irrigation projects either through the iniative of the board or by petition of landowners. The board also has responsibility for collecting and correlating all existing information concerning the water resources of the state, for surveying and inventorying the water resources, and for planning domestic and industrial water systems. (Moorhouse-Florida)
W77-10493

WATER DISTRICTS; WATER MASTERS; DISTRIBUTION OF WATER GENERALLY: CHANGE IN USE OR TRANSFER OF RIGHTS.
Ore Rev Stat secs 540.010 thru .990 (1973).

Descriptors: *Oregon, *Water districts, *Water management(Applied), *Water distribution(Applied), Water policy, Wells, Reservoirs, Well regulations, Water rights, Prior appropriation, Appropriation, Priorities, Dams, Water wells, Water users, Water works, Ditches, Water law, Legal aspects, Reservoir operation, Reservoir construction.

Oregon has enacted legislation providing that water districts may be created by the state engineer. Such districts are to be under the charge of a watermaster having supervisory powers. These watermasters have authority to make regulations regarding the use of all streams and wells within the districts. Various duties of the watermaster include the settlement of disputes as to water rights, regulation of water works and reservoirs in times of water scarcity, and regulation of headgates to ditches or the controlling works to wells or reservoirs. Persons requesting the use of a watermaster must pay the set statutory fee. Failure to pay will result in a lein on the appurtenant water work or land. It is also provided that construction of dams, dykes, and other hydraulic works are subject to inspection by the state engineer. Statutory procedures are set forth allowing owners of water rights to change water uses and places of use without a loss of priority. Injunctions, fines, and jail sentences are provided for statutory enforcement. (Josepher-Florida)
W77-10494

GROUND WATER ACT OF 1955 (REGULATION OF UNDERGROUND WATERS THRU A PERMIT SYSTEM).
Ore Rev Stat secs 537.505 thru .990 (1973).

Descriptors: *Oregon, *Groundwater resources, *Legislation, *Water allocation(Policy), *Water permits, Permits, Well regulations, Well permits, Wells, Appropriation, Stock water, Domestic water, Beneficial use, Water rights, Water resources development, Water management(Applied), Prior appropriation, Water conservation, Water measurement.

Oregon has enacted statutory provisions to insure that the groundwater of the state is benefically used. Most uses of ground water are unlawful without appropriation permits; however, certain noncommercial, domestic, single industrial and stockwatering uses are exempt from permit registration. Registration statements must be filed by all persons claiming appropriation rights which vested prior to this permit system. The required content of permit applications is described and procedures for determining relative rights to appropriate water from ground water reservoirs are detailed. The location, extent, capacity and quality of ground water sources are to be identified by the state. Provisions are included to prevent or control the depletion or waste of ground water supplies. In addition, well construction is regulated by stringent licensing and reporting requirements. (Josepher-Florida)
W77-10495

SCENIC WATERWAYS (DESIGNATION, ACQUISITION, AND PROTECTION).
Ore Rev Stat secs 390.805 thru .925 (1973).

Descriptors: *Oregon, *Scenic easements, *Scenery, *Wild rivers, *Conservation, Land development, Land appraisals, Wildlife conservation, Rivers, River flow, Land use, Land management, Landscaping, Permits, Scenic highways, State governments, Streams, Land resources, Wildlife.

Oregon has designated some of its rivers as 'scenic waterways'. The purpose of this designation is to strike a balance between policies permitting the construction of dams and other impoundments of rivers and policies which would preserve Oregon's rivers in their natural free-flowing state. Recreation, fish and wildlife uses are declared to be the highest and best uses of waters within scenic waterways. The construction of dams, reservoirs or other impoundments wihin scenic waterways is prohibited. Furthermore, land use within one-fourth of one mile on each side of river banks of scenic waterways is regulated so as to enhance the aesthetic value of the waterway itself. The construction of buildings, railroads, utilities, or business structures within scenic areas is prohibited unless state approval is obtained. The State Highway Commission is empowered to make purchases for the acquisition of easements and related adjacent lands. Procedures for the purchase of adjacent lands, assessment of property values, and transfer of public lands are also included. (Josepher-Florida)
W77-10496

SUBMERSIBLE AND SUBMERGED LANDS (STATE OWNERSHIP OR JURISDICTION).
Ore Rev Stat secs 274.005 thru .990 (1971).

Descriptors: *Oregon, *Submerged Lands Act, *Swamps, *Lake beds, *Tidal waters, Leases, Legal aspects, Bays, Streams, Lakes, Bids, State jurisdiction, State governments, Tidal marshes, Interest, Sulfur, Kelps, Drilling, Geological surveys, Geophysics.

Oregon has enacted legislation providing for the acquisition and ownership or rights, titles, or interests in submersible and submerged lands. Titles to submerged and submersible lands in Oregon which have not previously vested in any persons are now vested in the state. Sales, leases and easements of submersible lands owned by the state must be in accord with these provisions. The state may enter into contracts for drainage and reclamation of lakes, marshes, and swamps. The Division of State Lands may cause reclamation surveys, plans and specifications to be made. Also here included are provisions for removal of materials and for mineral extraction from the beds of streams, bays, and lakes. Additional provisions cover: bid procedures; sulfur, kelp, and drilling leases; applications for geological and geophysical surveys relating to tidal submerged and submersible lands; and ownership rights relating to the creation of new lands created upon submerged lands. (Josepher-Florida)
W77-10497

NATIONAL RENDERERS ASSOCIATION V ENVIRONMENTAL PROTECTION AGENCY (REVIEW OF EPA EFFLUENT LIMITATIONS FOR RENDERERS).
541 F2d 1281-92 (8th Cir 1976).

Descriptors: *Water pollution sources, *Administrative decisions, *Federal government, *Water quality standards, Legislation, Federal Water Pollution Control Act, Regulation, Permits, Administrative agencies, Industrial wastes, Effluents, Water pollution, Chemical industry, Food processing industry, Economics.
Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, *Effluent guidelines.

Petitioner association and member companies sought direct review of regulations promulgated by the Environmental Protection Agency (EPA) setting standards for effluent discharges from new plants, under authority of the Federal Water Pollution Control Act of 1972. Petitioners alleged that technology other than that specified by the EPA would be needed, that the initial cost of the technology would be higher than estimated, and that annual costs would be so high that new plants would not be built. The EPA, while conceding some issues regarding the necessary technology, presented evidence tending to show that the industry does have the ability to raise reasonable amounts of capital for pollution control equipment. The court defined its task as determining whether the EPA's decision was arbitrary, an abuse of discretion, or otherwise not in accordance with law. After a point-by-point analysis, the court rejected the new source standards. The matter was remanded to the EPA for proceedings to determine the required technology, necessary costs, and an economic analysis of the ways in which the guidelines will affect construction of new plants. (Molloy-Florida)
W77-10498

UNITED STATES V RESERVE MINING COMPANY (DISCHARGE OF TACONITE TAILINGS INTO LAKE SUPERIOR CAUSING DISCOLORATION OF SURFACE WATER).
412 F Supp 705-14 (D Minn 1976).

Descriptors: *Mine wastes, *Asbestos, *Lake Superior, *Pollution abatement, *Minnesota, Permits, Regulation, State governments, Water purification, Water treatment, Strip mine wastes, Cost allocation, Economics, Water pollution sources, Safety factors, Judicial decisions, Legal aspects, Penalties(Legal).
Identifiers: Standing(Legal), Duluth.

Plaintiffs sought an order imposing penalties for violations of state pollution control laws and excess costs for water purification treatment. Defendant mining company was discharging huge quantities of waste directly into Lake Michigan daily. In a suit to enjoin the activity, the defendant had caused delays in bad faith, and failed to properly answer discovery attempts. The court then imposed daily penalties for violations of the terms of defendant's discharge permit, for the period from enactment of the penalty statute until the discharge was enjoined. The costs of filtering asbestos from the drinking water of the city of Duluth were taxed against the defendant as Duluth had standing to sue as an injured party. In addition, suit costs and partial attorney's fees were charged the defendant because of the bad faith in failing to properly answer interrogratories and failing to respond to court orders. Discharges of taconite tailings into Lake Michigan could have been made on land within a reasonable cost-allocation, and defendant's allegation that such disposal was impossible had no foundation in fact. (Molloy-Florida)
W77-10499

ARTESIAN WELLS.
Utah Code Ann, sec 73-2-21 (1958).

Descriptors: *Legislation, *Utah, *Artesian wells, *State jurisdiction, *Water management(Applied), Water sources, Water wells, Wells, Water supply, Legal aspects, Water law, Administration,

Planning, Legislation, Preferences(Water rights), Water control, Water rights, Water conservation, Water policy, Public rights, Water loss, Regulation.

The Utah state engineer is authorized to plug, repair, or otherwise control artesian wells which are wasting public water. He may, on behalf of the state, enter into co-operative agreements with well owners. Under such agreements the state would agree to provide the necessary equipment and supervision for well control operations, or to share the expense. The state engineer shall exercise reasonable precautions to preserve the flow of water from such wells. In addition, abandoned wells on public lands or wasting wells on private lands may be plugged entirely at the expense of the state. (Cowart-Florida)
W77-10500

RELEASING DEAD ANIMALS, ETC., INTO OR NEAR WATERS.
W Va Code Ann secs 16-9-2 thru 16-9-3 (Supp 1975).

Descriptors: *West Virginia, *Legislation, *Water Quality Act, *Public health, Water quality, Water pollution control, Streams, Running waters, Streamflow, Water pollution, Banks, Riparian land, Drainage systems, Roads, Urban runoff, Public lands, Water law, Environmental sanitation.

Any person who knowingly and willfully throws or releases any dead animal, garbage, excrement or offensive substance into any well, stream, or other body of water used for domestic purposes in West Virginia is guilty of a misdemeanor. Similarly, the release of such substances on land adjacent to running water in such a location that high water or normal drainage will wash the substance into the stream, the release of such substances on public right-of-ways are also proscribed. Furthermore, one who knowingly permits such offensive materials to remain on private property under his control for 24 hours after notice of the public health menace or nuisance created thereby is guilty of a misdeamor. None of the above provisions are applicable to state regulated commercial and industrial wastes. Conviction for either offense is punishable by a fine. The fine for release into domestic waters is punishable by ranges from 25 to 200 dollars while the fine for the deposit of offensive substances on public or private land ranges from 100 to 1000 dollars. The statutes provide for a separate punishable offense for each successive 24 hour period in which the material is not removed and destroyed. (Moorhouse-Florida)
W77-10501

KANSAS TASK FORCE TO DEVELOP WATER USE PROGRAM TO RESOLVE SERIOUS PROBLEMS,
For primary bibliographic entry see Field 4B.
W77-10522

NEBRASKA ISSUES REGULATIONS UNDER SAFE DRINKING WATER ACT OF 1976.
For primary bibliographic entry see Field 5G.
W77-10523

MULTIFUNCTIONAL APPROACH TO POLLUTION PREVENTION,
Yorkshire Water Authority (England).
For primary bibliographic entry see Field 5G.
W77-10638

THE (WEST GERMAN) WASTE WATER DISCHARGE TAX LAW (DAS ABWASSERABGABENGESETZ),
Technische Universitaet, Darmstadt (West Germany).
For primary bibliographic entry see Field 5G.
W77-10695

6F. Nonstructural Alternatives

DYNAMICS OF URBAN DEVELOPMENT ON FLOOD PLAINS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 4A.
W77-10179

OPTIMAL EXPANSION OF FLOOD CONTROL SYSTEMS, (FINAL REPORT: VOLUME I),
Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering.
T. L. Morin, and Y. S. Shin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 643, Price codes: A04 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 121, March 1977, 56 p, 1 fig, 47 ref. OWRT A-079-ILL(1).

Descriptors: *Flood control, *Dynamic programming, Optimization, *Non-structural alternatives, *Methodology, *Planning, Algorithms, *Optimum development plans.
Identifiers: Structural and nonstructural measures, *Capacity expansion planning, Branch-and-bound, Water resources systems, *Myopic decision rules.

Despite substantial expenditures on flood protection structures, flood damages continue to increase. One explanation for this apparent paradox is that the structural measures often provide a false sense of security to existing and potential floodplain occupants and, as such, may actually result in increased flood damages, contrary to their intended purpose. This realization, among others, has led to an increasing interest in the role of nonstructural measures as an integral part of any overall flood protection plan. This report presents methodologies for the planning of flood control systems of structural measures, as well as a first cut at methodologies for the planning of flood control systems consisting of both structural and nonstructural measures. Specifically, myopic decision rules, dynamic programming and hydrid dynamic programming/branch-and-bound algorithms are developed for capacity expansion planning with both independent and dependent projects under budgetary constrants. Similar methodologies are also presented for capacity expansion planning with both deterministic and stochastic demand. The advantages and shortcomings of the methodologies are discussed and promising directions for future research are indicated. (See also W77-09927)
W77-10263

FLOODPLAIN ZONING--AN ALTERNATIVE APPROACH TO LAND REGULATION IN FLOOD HAZARD AREAS,
S. D. Mac Rae.
Shore and Beach, Vol 44, No 1, p 31-33, April 1976.

Descriptors: *Flood control, *Flood plains, *Floodways, *Michigan, *Flood plain zoning, Non-structural alternatives, Legislation, Flood data, State jurisdiction, Land use, Flood plain insurance, Land management, Flood protection, Flood frequency, Dredging, Legal aspects, Channel improvement, Water policy, Floodwater zoning.
Identifiers: *Environmental policy, State policy, Flood fringe districts.

In response to a flood hazard condition, Kalamazoo, Michigan has proposed floodplain regulations which establish floodway and flood fringe districts. A floodplain is an area of land adjoining a body of water which has been or may be covered by floodwater. Floodway districts are high flood hazard areas usually located adjacent to the principal channel while a flood fringe district is located just beyond the floodway. The reasonableness of a floodplain ordinance is based upon a determination of the extent of the flood hazard. Taken into account are such factors as historical evidence of flooding, flood frequency, and flood levels. Floodplain zoning provisions have been upheld by the courts under the broad health, safety, and general welfare language of zoning codes. Kalamazoo's regulations require floodway lands to remain open, thus lessening the potential for damages in the overall floodplain. Flood fringe areas are open to a wide variety of development provided that such development is protected from flood waters. Kalamazoo's regulations comply with Michigan floodplain management standards as well as the Federal Flood Insurance Program. The author feels that adoption of floodplain zoning provisions such as those proposed by Kalamazoo can significantly deter improper and indiscreet development in the floodplain. (Cocheu-Florida)
W77-10451

6G. Ecologic Impact Of Water Development

COMPARATIVE LIMNOLOGY OF DIFFERENTIALLY REGULATED SECTIONS OF A COLORADO MOUNTAIN RIVER,
Colorado State Univ., Fort Collins. Dept. of Zoology; and Colorado State Univ., Fort Collins. Dept. of Entomology.
J. F. Ward.
Archiv fur Hydrobiologie, Vol. 78, No. 3, Sept. 1976, p. 319-342. 5 fig, 10 tab, 35 ref.

Descriptors: *Dams, *Streams, *Environmental effects, *Environmental gradient, Rivers, Gastropods, Chemical properties, *Colorado, Distribution, Limnology, Stoneflies, Algae, Invertebrates, Mayflies, Diptera.
Identifiers: *South Platte River(Colorado), *Deep-release dams, Gammarus, Submerged angiosperms, Macroinvertebrates.

The effects and extent of the ecologic impact of deep-release dams on the South Platte River on the east slope of the Continental Divide in the Rocky Mountains of Colorado was studied by means of all-year monititing of ecosystem parameters at four study sites differentially regulated by the dams. Greater development of algae and submerged angiosperms at more regulated sites were reflected in lower free carbon dioxide and higher pH values. Bound co-2 and total dissolved salts progressively decreased downstream from the dam, exhibiting lowest values at unregulated sites. Macroinvertibrates exhibited lower standing crops but much higher diversity at unregulated sites. Gammarus and gastropods were found only at regulated sites, whereas filipalpian stoneflies, heptageniid mayflies and certain dipterans were not found below the dam. These distribution restrictions are explained by differences in (1) chemical limiting factors; (2) distribution and abundance of submerged angiosperms and epilithic algae; (3) diversity of organic matter inputs; (4) predation pressure and competitive interactions; (5) environmental stability and predictability; and (6) thermal signals. (Harris-Wisconsin).
W77-10155

A GENERAL PURPOSE UNIVARIATE PROBABILITY MODEL FOR ENVIRONMENTAL DATA ANALYSIS,
Environmental Protection Agency, Washington, D. C., Office of Research and Development.
W. R. Ott, and D. T. Mage.
Computers and Operations Research, Vol. 3, No. 2/3, p 209-216, August 1976. 5 fig, 2 tab, 13 ref.

Descriptors: *Environment, *Data collections, *Probability, *Water quality, Air pollution, Water resources, Ohio River, Pollutants, Standards, Monitoring, Equations, Operations research, Biochemical oxygen demand.

Identifiers: *Univariate probability model, *Data analysis, Physical processes, Chemical processes, Diffusion processes.

The analysis of environmental quality data for decision making purposes generally requires a suitable univariate probability model. It is sometimes difficult, when many probability models are available, to select the most appropriate one for a given data set. The underlying physical laws which generate pollutant concentrations--diffusion processes--offer insight into which model may be most appropriate for a variety of situations. Treating the diffusion equation as a stochastic differential equation, the time series of pollution concentration data from diffusion phenomena is shown to have a distribution that is best approximated by the censored, 3-parameter lognormal probability model (LN3C). The model is applied to 10 air quality data sets (SO2, O3, CO, particulate, hydrocarbons, and NO2 from the United States, France, West Germany, and Denmark) and 9 water quaity data sets (BOD, coliform, chloride, and sulfate from the Ohio River). It is concluded that the LN3C probability model offers data analysts a superior, general purpose model suitable for a large variety of environmental phenomena. (Bell-Cornell)
W77-10291

AN ECOSYSTEM APPROACH TO THE PLANNING OF WATER POLLUTION CONTROL,
University of New England, Armidale (Australia). School of Natural Resources.
For primary bibliographic entry see Field 5G.
W77-10367

IMPACTS OF NUCLEAR RELEASES INTO THE AQUATIC ENVIRONMENT.
International Atomic Energy Agency Vienna (Austria).
For primary bibliographic entry see Field 5C.
W77-10384

ETUDE DE LA CONTAMINATION DE CONSTITUANTS DU MILIEU MARIN PAR DES FORMES SOLUBLES ET INSOLUBLES DE RADIONUCLIDES, (STUDY OF THE CONTAMINATION OF COMPONENTS OF THE MARINE ENVIRONMENT BY SOLUBLE AND INSOLUBLE FORMS OF RADIONUCLIDES),
CEA Centre de la Hague, Cherbourg (France). Laboratoire de Radioecologie Marine.
For primary bibliographic entry see Field 5C.
W77-10388

DREDGE RIVER CHANNEL: NAVAL SUBMARINE BASE, NEW LONDON, GROTON, CONNECTICUT (FINAL SUPPLEMENT TO FINAL ENVIRONMENTAL IMPACT STATEMENT).
Naval Facilities Engineering Command, Philadelphia, Pa. Northern Div.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 433 and ADA-031 435, Price codes: A99 in paper copy, A01 in microfiche. September 1976. 2 vols.

Descriptors: *Environmental effects, *Dredging, *Channel improvement, *Submarines, Spoil banks, Federal government, Disposal, Military aspects, Naval architecture, Earthworks, Rivers, Connecticut, Channels, Beds, Sedimentation, Project feasibility, Project planning, Project purposes, Alternate planning, Benefits, Costs, Engineers estimates.
Identifiers: *Environmental impact statement, Administrative regulations, Navigation obstructions.

This document reviews the environmental impact of river channel dredging operations at the naval submarine base in New London, Groton, Connecticut. The operations were undertaken to accommodate the new deep-draft SSN 688 class submarines as well as a related floating drydock facility. Approximately 2.8 to 2.9 million cubic yards of material would be dredged and deposited at a designated ocean disposal site. Both the commercial shipping and the commercial fishing industries would be enhanced due to an increase in channel depth and the removal of polluted sediments from the Thames River, thus increasing the productivity of the estuary. No short term or long term adverse environmental effects have been detected for either the dredging or disposal sites. Several alternative dredging and disposal techniques and systems were considered, however, the present program was deemed the most environmentally acceptable. Comments and suggestions were solicited from federal and state agencies as well as private organizations and individuals. They are included within the report. (Moorhouse-Florida)
W77-10454

A LONG-RANGE PROGRAM FOR MEETING THE PAPER INDUSTRY'S ENVIRONMENTAL PROTECTION TECHNICAL INFORMATION NEEDS,
National Council of the Paper Inustry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5G.
W77-10720

MODIFICATION OF ISLAND VEGETATION AFTER RISING GROUNDWATER LEVELS ON THE DANUBE ISLANDS AT OFFINGEN, (IN GERMAN),
Forstliche Forschungsanstalt, Munich (West Germany). Weldbauinstitut.
For primary bibliographic entry see Field 2I.
W77-10725

COLONIZATION OF IMPERILED PLANTS IN DREDGED LAKES OF THE UPPER RHINE PLAIN, (IN GERMAN),
Gruenlandwirtschaft Futerbau, Aulendorf (West Germany). Staatliche Versuchsanstalt.
For primary bibliographic entry see Field 2H.
W77-10730

7. RESOURCES DATA

7A. Network Design

GEOLOGICAL SURVEY RESEARCH 1976.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W77-10560

METHODOLOGY FOR RIVER-QUALITY ASSESSMENT WITH APPLICATION TO THE WILLAMETTE RIVER BASIN, OREGON,
Geological Survey, Portland, Oreg. Water Resources Div.
D. A. Rickert, W. G. Hines, and S. W. McKenzie.
Branch of Distribution, USGS 1200 S. Eads St., Arlington, VA 22202. Circular 715-M, 1976. 55 p, 23 fig, 12 tab, 71 ref.

Descriptors: *Water quality, *Evaluation, *Methodology, *River basins, *Oregon, Assessments, Projects, Data collection, Water pollution sources, Chemical analysis, Trace elements, Nutrients, Dissolved oxygen, Algal control, Land development, Industrial wastes, Planning, Water resources development, Water quality control, *Willamette River Basin.

The U.S. Geological Survey completed an intensive river-quality assessment in the Willamette River basin, Oregon in 1976. The objectives were to (1) develop a practical framework for conducting comprehensive river-quality assessments; (2) determine the kinds and amounts of data required to adequately assess river-quality problems; (3) develop techniques for evaluating data and for presenting it so as to promote better public understanding of its significance; (4) develop and document methods for evaluating basin-development alternatives in terms of potential impacts on river quality; and (5) apply the framework, data, and methods to assess the existing or potential river-quality problems of the Willamette River basin. This circular covers the five objectives by examining overall project development and pertinent results from the assessment of four river-quality related problems. The assessed problems were: (1) the effect of population and industrial growth and resulting waste discharges on dissolved oxygen, (2) the potential for nuisance algal growths, (3) the possibility of trace-metal accumulation in river-bottom sediments, and (4) the potentially harmful effects of accelerated erosion resulting from intensified land use. The methods and results of the assessments are pertinent to resource issues being debated across the United States. (Woodard-USGS)
W77-10565

WATER-RESOURCES INVESTIGATIONS IN MONTANA, 1976.
Geological Survey, Helena, Mont. Water Resources Div.
U.S. Geological Survey Reston, Va. 22092. 1977, Folder.

Descriptors: *Water resources, *Investigations, *Montana, Surveys, Hydrologic data, Basic data collections, Streamflow, Sediment yield, Precipitation(Atmospheric), Groundwater, On-site investigations, Bibliographies, Networks, Maps.

Water-resources studies and investigations in Montana made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show areas covered by published or open-file groundwater reports, annual sediment yield of streams, principal sources of groundwater, discharge of the principal rivers, mean annual precipitation, flood-prone areas, average annual runoff, and quality of surface waters. A larger map shows the hydrologic data network and investigations in Montana. (Woodard-USGS)
W77-10573

WATER-RESOURCES INVESTIGATIONS IN OKLAHOMA, 1976.
Geological Survey, Oklahoma City, Okla. Water Resources Div.
U.S. Geological Survey Reston, Va. 22092. 1977, Folder.

Descriptors: *Water resources, *Investigations, *Oklahoma, Surveys, Hydrologic data, Basic data collections, Streamflow, Groundwater, On-site investigations, Water level fluctuations, Bibliographies, Networks, Maps.

Water-resources studies and investigations in Oklahoma made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show average annual runoff, average

annual precipitation, discharge and chemical quality of principal rivers, principal sources of groundwater, basin reports on surface-water resources, and flood-prone areas. A larger map shows the hydrologic data network and investigations in Oklahoma. (Woodard-USGS)
W77-10574

WATER-RESOURCES INVESTIGATIONS IN WYOMING, 1976.
Geological Survey, Cheyenne, Wyo. Water Resources Div.
Available from the U.S. Geological Survey Reston, VA 22092. 1977. Folder.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Wyoming, Surveys, Hydrologic data, Basic data collections, Streamflow, Runoff, Precipitation(Atmospheric), Flood plains, Groundwater, On-site investigations, Dissolved solids, Water level fluctuations, Bibliographies, Networks, Maps.

Water-resources studies and investigations in Wyoming made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water management streamflow stations; groundwater observation wells; and water quality observation sites. Small State maps show mean annual precipitation, average annual runoff, sediment concentrations in rivers, principal sources of groundwater, discharge of the principal rivers, flood-prone areas, and the dissolved solids in surface waters. A larger map shows the hydrologic data network and investigations in Wyoming. (Woodard-USGS)
W77-10575

AN EVALUATION OF PRECIPITATION GAGE DENSITY IN A MOUNTAINOUS TERRAIN,
Stephen F. Austin State Univ., Nacogdoches, Tex. School of Forestry.
For primary bibliographic entry see Field 2B.
W77-10800

7B. Data Acquisition

SEASONAL OCEANIC PRECIPITATION FREQUENCIES FROM NIMBUS 5 MICROWAVE DATA,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W77-10105

DETERMINATION OF RAINFALL DISTRIBUTIONS FROM MICROWAVE RADIATION MEASURED BY THE NIMBUS 6 ESMR,
Wisconsin Univ.-Madison. Dept. of Meteorology.
For primary bibliographic entry see Field 2B.
W77-10106

A FIELD EXPERIMENT ON THE CALIBRATION OF RADARS WITH RAINDROP DISDROMETERS,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W77-10112

A SATELLITE TECHNIQUE FOR QUANTITATIVELY MAPPING RAINFALL RATES OVER THE OCEANS,
National Aeronautics and Space Adminstration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W77-10113

AN INVESTIGATION OF THE PARTICULATE PHASE OF ACID PRECIPITATION,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 2B.
W77-10178

THE DESIGN OF A FULLY AUTOMATIC LIQUID INJECTION APPARATUS FOR USE ON A CARBON ANALYSER,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W77-10209

A QUANTITATIVE SAMPLER FOR SUBMERGED AQUATIC MACROPHYTES,
Rhodes Univ., Grahamstown (South Africa). Inst. of Freshwater Studies.
C. Howard-Williams, and T. G. Longman.
Journal of the Limnological Society of Southern Africa, Vol. 2, No. 1, p 31-33, 1976. 1 fig, 1 tab, 6 ref.

Descriptors: *Bottom sampling, Aquatic plants, Biomass, Vegetation, Equipment, Submerged plants, Sampling.
Identifiers: South Africa, *Macrophytes, Swartvlei, Wilderness lakes, Potamogeton pectinatus.

A simple rotary sampler, capable of quantitatively harvesting submerged aquatic macrophytes, is described. The sampler can be operated from a boat and consists of central rod with a specially designed cutting blade at the base, and collecting hooks to catch the cut material. The values obtained with this sampler were not significantly different (at the 95% level of probability) from those obtained by manual cutting underwater. The rotary sampler has great advantages in terms of time, ease of positioning, and effort over hand cutting. (So. African Water Info. Center)
W77-10226

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-10267

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2E.
W77-10296

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
For primary bibliographic entry see Field 8B.
W77-10315

AUTOMATED HYDROGRAPHY FOR CHANNEL DREDGING,
Army Engineer District, Philadelphia, Pa. Survey Branch.
For primary bibliographic entry see Field 8B.
W77-10316

ACOUSTIC OCEANOGRAPHY,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-10318

EXPERIMENTAL DETERMINATION OF THE RADIO EMISSION OF THE UNDERLYING SURFACE ON LAMBDA = 2.1 CM,
Z. I. Gordon, and A. V. Frolov.
Soviet Hydrology, Selected Papers, Issue No. 4, p 256-260, 1975. 2 fig, 3 tab, 4 ref. Translated from Transactions of the Central Aerological Observatory (Trudy TsAO), No 116, p 68-76, 1974.

Descriptors: *Radiation, *On-site tests, *Surfaces, *Vegetation effects, On-site investigations, Remote sensing, Background radiation, Instrumentation, Measurement, Field crops, Corn(Field), Forests, Rivers, Grasses, Land, Radioactivity, Foreign research, Foreign countries, Soil moisture.
Identifiers: *Radiometer, Emissivity, Radio luminance temperature.

To solve meteorological and resource problems from a satellite, one must have information on the radio emission of the underlying surface. The surface contributes greatly to the radio luminance temperature recorded by an SHF radiometer on board a satellite or aircraft. A modulation radiometer, using a superheterodine circuit and having a response of 0.8 degrees and a time constant of 1 sec, was used to measure the radio emission of varying underlying surface areas under natural conditions. Emissivity, determined in the spring, summer, and autumn of 1971, was tabulated for cornfields, beet fields, forests, coastal shrubs, rivers, paths, grasses to left of paths, cut pea fields, and grasses under antenna. The radio luminance temperatures of given areas of the earth's surface can experience daily and seasonal fluctuations because of variation in the kinetic temperatures of the areas and because variations in emissivity produced by a change in the state of the surface, such as vegetation, soil moisture, etc. (Humphreys-ISWS)
W77-10322

TECHNIQUES FOR MEASURING STRESS IN SEA ICE,
Alaska Univ., College. Inst. of Arctic Environmental Engineering.
For primary bibliographic entry see Field 2C.
W77-10507

INSPECTION AND REPAIR OF MAIN-SEWERS (L'INSPECTION ET LA REPARATION DES COLLECTEURS D'EGOUTS),
For primary bibliographic entry see Field 5D.
W77-10541

AUTOMATIC NETWORK ANALYSIS BY MICROCOMPUTER.
For primary bibliographic entry see Field 5B.
W77-10544

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10662

AN OVERVIEW OF THE APPLICATIONS SYSTEM VERIFICATION TEST ON SNOWCOVER MAPPING,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10663

THE APPLICATION OF HYDROMETEOROLOGICAL DATA OBTAINED BY REMOTE SENSING TECHNIQUES FOR MULTIPURPOSE RESERVOIR OPERATIONS,
Salt River Project, Phoenix, Ariz.
For primary bibliographic entry see Field 4A.

W77-10664

INTERPRETATION OF SNOWCOVER FROM SATELLITE IMAGERY FOR USE IN WATER SUPPLY FORECASTS IN THE SIERRA NEVADA,
California State Dept. of Water Resources, Sacramento. Snow Surveys Branch.
For primary bibliographic entry see Field 4A.
W77-10665

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS IN RIO GRANDE DRAINAGE OF COLORADO,
Soil Conservation Service, Denver, Colo.
For primary bibliographic entry see Field 4A.
W77-10666

OPERATIONAL APPLICATION OF SATELLITE SNOWCOVER OBSERVATIONS-NORTHWEST UNITED STATES,
Bonneville Power Administration, Beaverton, Oreg. Hydrology Section.
F. A. Limpert.
In: Operational Applications of Satellite Snowcover Observations; Report No. NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 71-85, 1975. 3 fig, 5 tab, 2 ref.

Descriptors: *Remote sensing, *Snow cover, *Runoff, *Columbia River, *Pacific Northwest U.S., Satellites(Artificial), Snowpacks, Snow, Snowmelt, Watersheds(Basins), Hydroelectric power, Streamflow, Rivers, Projects, Mapping.
Identifiers: *LANDSAT data.

A demonstration project has been undertaken in the Pacific Northwest to determine the applicability of satellite snowcover observations for operational use in three test areas of the Columbia River Basin. It is still too early to draw any definite conclusions on the use of satellite data for determining area of snowcover in this region; particularly with the large number of cloud-covered days, the problem of determining the snowline in forested areas, and the lack of high resolution with the Synchronous Meteorological Satellite (SMS) data. The addition of new satellites this past year and future improvement in resolution should materially improve satellite data. Yet to be tested is the turn around time in getting the satellite data from the receiver sites to the user for real-time application. Nonetheless, what we have seen to date shows that satellite determination of snow coverage is a promising adjunct to our current methods. Continuation of our project, particularly with the deep snowpack and late runoff experienced in 1975, should provide us with much added information. (See also W77-10662) (Sims-ISWS)
W77-10667

UTILIZATION OF LANDSAT MONITORING CAPABILITIES FOR SNOWCOVER DEPLETION ANALYSIS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2C.
W77-10670

OPERATIONAL USE OF LANDSAT IMAGERY FOR THE ESTIMATION OF SNOW AREAL EXTENT,
California Univ., Berkeley. Remote Sensing Research Program.
E. F. Katibah.
In: Operational Applications of Satellite Snowcover Observations; Report No NASA SP-391. Proceedings of workshop held August 18-20, 1975, South Lake Tahoe, California, p 129-142, 1975. 4 fig, 5 tab, 11 ref. NASA NGL 05-003-404.

Descriptors: *Remote sensing, *Snow cover, *Runoff, Satellites(Artificial), Snowpacks, Snow, Snowmelt, Melting, Streamflow, Data processing, Analytical techniques, Watersheds(Basins), Streamflow.
Identifiers: *LANDSAT data.

Quantification of the surface area of snow covering watersheds can be a useful parameter in estimating snow water content for inclusion in water runoff prediction equations. This paper documented an operational manual interpretation technique which allows fast and accurate estimates to be made of the areal extent of snow parameter using LANDSAT-1 imagery. The analysis procedures and the statistical results were presented in this paper. (See also W77-10662) (Sims-ISWS)
W77-10671

OPERATIONAL APPLICATIONS OF NOAA-VHRR IMAGERY IN ALASKA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W77-10672

EMPLOYMENT OF SATELLITE SNOWCOVER OBSERVATIONS FOR IMPROVING SEASONAL RUNOFF ESTIMATES,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 4A.
W77-10673

APPLICATIONS OF SATELLITE SNOW COVER IN COMPUTERIZED SHORT-TERM STREAMFLOW FORECASTING,
For primary bibliographic entry see Field 4A.
W77-10674

SIERRA NEVADA SNOW MELT FROM SMS-2,
National Environmental Satellite Service, Redwood City, Calif. Satellite Field Services Station.
For primary bibliographic entry see Field 2C.
W77-10675

SYNOPSIS OF CURRENT SATELLITE SNOW MAPPING TECHNIQUES, WITH EMPHASIS ON THE APPLICATION OF NEAR-INFRARED DATA,
Environmental Research and Technology, Inc., Concord, Mass.
For primary bibliographic entry see Field 2C.
W77-10676

APPROACHES TO DIGITAL SNOW MAPPING WITH LANDSAT-1 DATA,
Zurich Univ. (Switzerland). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W77-10677

AN ALL DIGITAL APPROACH TO SNOW AREAL MAPPING AND SNOW MODELING,
California Univ., Davis.
For primary bibliographic entry see Field 2C.
W77-10678

DIGITAL SNOW MAPPING TECHNIQUE USING LANDSAT DATA AND GENERAL ELECTRIC IMAGE 100 SYSTEM,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 2C.
W77-10679

SNOW COVER MONITORING BY MACHINE PROCESSING OF MULTITEMPORAL LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10680

SNOWCOVER MAPPING BY MACHINE PROCESSING OF SKYLAB AND LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10681

A PROGRESS REPORT ON ESTIMATING SNOW DEPTH USING VHRR DATA NOAA ENVIRONMENTAL SATELLITES,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10682

A COMPARISON OF OPERATIONAL AND LANDSAT-AIDED SNOW WATER CONTENT ESTIMATION SYSTEMS,
California Univ., Berkeley. Social Sciences Group.
For primary bibliographic entry see Field 2C.
W77-10683

RED AND NEAR-INFRARED SPECTRAL REFLECTANCE OF SNOW,
Cold Regions Research and Engineering Laboratory, Hanover, N.H.
For primary bibliographic entry see Field 2C.
W77-10684

REMOTE SENSING OF SNOWPACK DENSITY USING SHORTWAVE RADIATION,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10685

MICROWAVE EMISSIONS FROM DRY AND WET SNOW,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10687

APPLICATION OF BAYESIAN DECISION THEORY TO AIRBORNE GAMMA SNOW MEASUREMENT,
National Weather Service, Portland, Oreg. River Forecast Center.
For primary bibliographic entry see Field 2C.
W77-10688

SUMMARY OF THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS WORKING SESSION - AUGUST 20, 1975,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10689

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, COLUMBIA LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 8G.
W77-10783

ANALYTICAL EVALUATION OF TECHNIQUES FOR USE OF A LASER DOPPLER VELOCIMETER TO MEASURE FLOW AND TURBULENCE,
Colorado State Univ., Fort Collins. Dept. of Physics.
For primary bibliographic entry see Field 2E.
W77-10784

STRAIN METERS AND STRESS METERS FOR EMBEDMENT IN MODELS OF MASS CONCRETE STRUCTURES; REPORT 2, EVALUATION OF MICRODOT EMBEDMENT STRAIN GAGE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
For primary bibliographic entry see Field 8G.
W77-10785

AN EVALUATION OF PRECIPITATION GAGE DENSITY IN A MOUNTAINOUS TERRAIN,
Stephen F. Austin State Univ., Nacogdoches, Tex. School of Forestry.
For primary bibliographic entry see Field 2B.
W77-10800

7C. Evaluation, Processing and Publication

A SATELLITE TECHNIQUE FOR QUANTITATIVELY MAPPING RAINFALL RATES OVER THE OCEANS,
National Aeronautics and Space Adminstration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W77-10113

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VI. GATES, STOP LOGS, AND TRASHRACKS,
Office of the Chief of Engineers (Army), Washington, D.C. Structural Section.
For primary bibliographic entry see Field 8C.
W77-10135

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME IX. SHEET PILE WALLS AND T-WALLS,
Army Engineer District, New Orleans, Louisiana, Design Branch.
For primary bibliographic entry see Field 8B.
W77-10136

RECOMMENDATIONS FOR THE ROUTINE RECORDING OF BOREHOLE DATA FOR HYDROGEOLOGICAL PURPOSES,
National Physical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 4B.
W77-10224

EVALUATION OF FRESHWATER WETLANDS DEFINITIONS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 2H.
W77-10267

DEVELOPMENT OF A COMPREHENSIVE TVA WATER RESOURCE MANAGEMENT PROGRAM,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 6A.
W77-10289

A GENERAL PURPOSE UNIVARIATE PROBABILITY MODEL FOR ENVIRONMENTAL DATA ANALYSIS,
Environmental Protection Agency, Washington, D. C., Office of Research and Development.
For primary bibliographic entry see Field 6G.
W77-10291

AN EVALUATION OF ECONOMIC AND DEMOGRAPHIC DATA USEFUL IN WATER RESOURCES PLANNING.
Bureau of Economic Analysis, Washington, D.C. Regional Economic Analysis Div.
For primary bibliographic entry see Field 6B.
W77-10295

ANALYSIS OF THE STOCHASTIC COINCIDENCE OF CERTAIN HYDROLOGICAL PROCESSES,
For primary bibliographic entry see Field 2E.
W77-10299

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VII. SINGLE- AND MULTICELL CONDUITS AND TUNNELS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8A.
W77-10333

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VIII. PILE FOUNDATIONS AND SHEET PILE CELLS,
Army Engineer Div. Southwestern, Dallas, Tex.
For primary bibliographic entry see Field 8A.
W77-10334

HIERARCHICAL ANALYSES OF WATER RESOURCES SYSTEMS, MODELING AND OPTIMIZATION OF LARGE-SCALE SYSTEMS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 6A.
W77-10418

APPLICATION OF MATHEMATICAL MODELS IN HYDROLOGY AND WATER RESOURCES SYSTEMS.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2A.
W77-10419

A NEW METHOD FOR MODELLING MONTHLY DISCHARGE SERIES,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 4A.
W77-10425

PERFORMANCE OF TWO DETERMINISTIC HYDROLOGICAL MODELS,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 4A.
W77-10426

SIMULATION OF THE HYDROLOGICAL CYCLE OVER THE TISZA VALLEY USING ATMOSPHERIC WATER VAPOUR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W77-10427

A HYDROLOGICAL MODEL WITH PHYSICALLY REALISTIC PARAMETERS,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W77-10428

APPLICATION OF DYNAMIC PROGRAMMING TO MODEL TRI-DIMENSIONAL FLOW IN POROUS MEDIA (APPLICATION DE LA PROGRAMATION DYNAMIQUE AUX MODELES TRIDEMENSIONNELS DE CALCUL DES ECOULEMENTS DANS LES MILIEUX POREUX),
Tehran Univ. (Iran), Dept. of Irrigation.
For primary bibliographic entry see Field 2F.
W77-10429

STOCHASTIC IDENTIFICATION OF NONLINEAR HYDROLOGICAL SYSTEMS,
Pittsburg Univ., Pa. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W77-10431

CHARACTERISTICS OF RAINFALL CELL PATTERNS IN THE SOUTHEAST COASTAL PLAIN AREAS OF THE USA, AND A COMPUTER SIMULATION MODEL OF THUNDERSTORM RAINFALL,
Middle East Technical Univ. Ankara (Turkey).
For primary bibliographic entry see Field 2B.
W77-10435

APPLICATION OF CONCEPTUAL RAINFALL-RUNOFF MODELS IN A COMPLEX PROGRAM,
Vyzkumny Ustav Vodohospodarsky, Prague (Czechoslovakia).
For primary bibliographic entry see Field 2A.
W77-10437

GENERATION OF HYDROLOGIC AND WATER RESOURCES SAMPLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10441

DATA COLLECTION, ANALYSIS AND INSTRUMENTATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W77-10442

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10506

LAKE ONTARIO ATLAS: LAKE TEMPERATURES,
New York Sea Grant Inst., Albany.
For primary bibliographic entry see Field 2H.
W77-10508

GREAT LAKES WATER TEMPERATURES, 1966-1975,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W77-10510

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 1. ARKANSAS RIVER BASIN, RED RIVER BASIN, SABINE RIVER BASIN, NECHES RIVER BASIN, TRINITY RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 081, Price codes: A25 in paper copy, A01 in microfiche. Water-Data Report TX-75-1, Vol 1, June 1976. 566 p, 5 tab, 23 ref.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, Arkansas River Basin, Red River Basin, Sabine River Basin, Neches River Basin, Trinity River Basin.

Surface-water data for the 1975 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 1) includes the Arkansas, Red, Sabine, Neches, and Trinity River basins and the intervening coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W77-10553 and W77-10554) (Woodard-USGS)
W77-10552

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 2. SAN JACINTO RIVER BASIN, BRAZOS RIVER BASIN, SAN BERNARD RIVER BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-257 082, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report TX-75-1, Vol 2, June 1976. 435 p, 5 tab, 31 ref.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, San Jacinto River Basin, Brazos River Basin, San Bernard River Basin.

Surface-water data for the 1975 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 2) includes the San Jacinto, Brazos, and San Bernard River basins and the intervening coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W77-10552 and W77-10554) (Woodard-USGS)
W77-10553

WATER RESOURCES DATA FOR TEXAS, WATER YEAR 1975--VOLUME 3. COLORADO RIVER BASIN, LAVACA RIVER BASIN, GUADALUPE RIVER BASIN, NUECES RIVER BASIN, RIO GRANDE BASIN AND INTERVENING COASTAL BASINS.
Geological Survey, Austin, Tex. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 083, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report TX-75-1, Vol 3 June 1976. 510 p, 5 tab, 31 ref.

Descriptors: *Texas, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Water temperature, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments, Colorado River Basin, Lavaca River Basin, Guadalupe River Basin, Nueces River Basin, Rio Grande Basin.

Surface-water data for the 1975 water year for Texas are presented in three volumes, appropriately identified as to content by river basins. This volume (Volume 3) includes the Colorado, Lavaca, Guadalupe, Nueces, and Rio Grande basins and intervening coastal basins. Data consist of records of stage, discharge, and water quality of streams and canals; and stage, contents, and water quality of lakes and reservoirs. Also included are crest-stage and flood-hydrograph partial-record stations, reconnaissance partial-record stations, and low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Texas. (See also W77-10552 and W77-10553) (Woodard-USGS)
W77-10554

WATER-QUALITY DATA FOR THE EAGLE RIVER VALLEY IN THE VICINITY OF EAGLE AND VAIL, WEST-CENTRAL COLORADO,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-10555

INDEX OF PUBLISHED SURFACE-WATER-QUALITY DATA FOR OKLAHOMA 1946-1975,
Geological Survey, Oklahoma City, Okla. Water Resources Div.
J. D. Stoner.
Open-file report 77-204, March 1977. 212 p, 3 fig, 4 tab.

Descriptors: *Water quality, *Surface waters, *Water analysis, *Oklahoma, Documentation, Data collections, Stations, Chemical analysis.

Surface water-quality data for Oklahoma have been published by the U.S. Geological Survey in cooperation with various State agencies on an annual basis since 1949. The published data represent 2,733 station-years of data from 527 stations, ranging from one sample from a station once during the thirty-year period to a continuously operating daily station where more than one hundred samples were collected in a year. The index was designed to provide the data user a means of rapid search for stations by downstream order, county, and alphabetically by stream or station name. The data types are divided into 10 broad water-quality categories. (Woodard-USGS)
W77-10567

A SIMPLE EFFECTIVE METHOD FOR THE COMPUTER SIMULATION OF GROUND-WATER STORAGE AND ITS APPLICATION IN THE DESIGN OF WATER RESOURCE SYSTEMS,
Department of the Environment, Reading (England). Central Water Planning Unit.
For primary bibliographic entry see Field 2F.
W77-10660

OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS.
National Aeronautics and Space Administration, Washington, D.C.
For primary bibliographic entry see Field 2C.
W77-10662

AN OVERVIEW OF THE APPLICATIONS SYSTEM VERIFICATION TEST ON SNOW-COVER MAPPING,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10663

THE OPERATIONAL PROGRAM OF SATELLITE SNOWCOVER OBSERVATION AT NOAA/NESS.
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W77-10668

USE OF AREAL SNOW COVER MEASUREMENTS FROM ERTS-1 IMAGERY IN SNOW-MELT-RUNOFF RELATIONSHIPS IN ARIZONA,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2C.
W77-10669

SYNOPSIS OF CURRENT SATELLITE SNOW MAPPING TECHNIQUES, WITH EMPHASIS ON THE APPLICATION OF NEAR-INFRARED DATA,
Environmental Research and Technology, Inc., Concord, Mass.
For primary bibliographic entry see Field 2C.
W77-10676

APPROACHES TO DIGITAL SNOW MAPPING WITH LANDSAT-1 DATA,
Zurich Univ. (Switzerland). Dept. of Geography.
For primary bibliographic entry see Field 2C.
W77-10677

AN ALL DIGITAL APPROACH TO SNOW AREAL MAPPING AND SNOW MODELING,
California Univ., Davis.
For primary bibliographic entry see Field 2C.
W77-10678

DIGITAL SNOW MAPPING TECHNIQUE USING LANDSAT DATA AND GENERAL ELECTRIC IMAGE 100 SYSTEM,
General Electric Co., Beltsville, Md.
For primary bibliographic entry see Field 2C.
W77-10679

SNOW COVER MONITORING BY MACHINE PROCESSING OF MULTITEMPORAL LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10680

SNOWCOVER MAPPING BY MACHINE PROCESSING OF SKYLAB AND LANDSAT MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 2C.
W77-10681

SUMMARY OF THE OPERATIONAL APPLICATIONS OF SATELLITE SNOWCOVER OBSERVATIONS WORKING SESSION - AUGUST 20, 1975,
National Aeronautics and Space Administration, New York. Goddard Inst. for Space Studies.
For primary bibliographic entry see Field 2C.
W77-10689

STABILIZATION OF POTENTIALLY LIQUEFIABLE SAND DEPOSITS USING GRAVEL DRAINS,
California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-10777

8. ENGINEERING WORKS

THE KWA DABEKA-CLERMONT SEWERAGE SCHEME-PLANNING, DESIGN AND OPERATION,
Theron (J. C.), Burke and Isaac, Inc. (South Africa).
For primary bibliographic entry see Field 5D.
W77-10220

8A. Structures

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME IX. SHEET PILE WALLS AND T-WALLS,
Army Engineer District, New Orleans, Louisiana, Design Branch.
For primary bibliographic entry see Field 8B.
W77-10136

A SANITARY ENGINEER'S VIEWPOINT ON TALL BUILDINGS,
Murray (Alex) Pty Ltd., Durban (South Africa).
G. T. Murray.
Municipal Administration and Engineering, Vol. 42, No. 487, p 48-61, 1976. 7 fig.

Descriptors: *Drainage systems, *Buildings, *Design, Installation, *Plumbing, Standards, Pipes, Architecture, Maintenance costs, Waste disposal, Sewerage, Education, *Sanitary engineering.
Identifiers: South Africa, Sovent system.

The shortcomings of the present approach to the design of plumbing and drainage systems for tall buildings are discussed. The urgent need for specialized education and areas of necessary improvement are covered. Modern complex buildings of more than 12 floors are discussed. (So African Water Info Center)
W77-10213

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VII. SINGLE- AND MULTICELL CONDUITS AND TUNNELS,
Army Engineer District, Tulsa, Okla.
G. W. Henson, C. M. Terzian, and R. J. Smith.
Volume 7 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Engineer Waterways Experiment Station Vicksburg, Mississippi, August 1976. 56 p, 4 fig, 2 tab, 6 ref, 1 append. N. Radhakrishnan, editor.

Descriptors: *Computer programs, *Tunnels, *Conduits, Construction, Tunnel construction, Dams, Levees, Design, Computers, Computer models, Structural models, Conferences, Structural design, Structural analysis, Engineering, Civil engineering.
Identifiers: *Computer-aided design, Single-cell conduits, Multi-celled conduits.

This paper examined the computer-aided design of cast-in-place single-barrer conduits through embankment type dams and levees. Circular and oblong shapes under high fill were emphasized. The paper used design criteria defined in EM 1110-2-2902, Conduits, Culverts and Pipes. Design loads are groundwater and surcharge water, internal water pressure, concentrated live loads, and backfill. The circular shapes were analyzed as rings of uniform thickness. Shearing and diagonal tension stresses are less critical for the circular shapes than those in the ACI code. A computer program rating procedure composed of 15 elements was devised to evaluate programs useful for the design of multicell conduits. The concrete conduits typically are used for river diversion through urban areas and in earthen dam embankments under high fills. Most Crops constructed tunnels are either water conveyance or transportation tunnels driven through rock. This paper was limited to ways in which the computer can be used to aid the structural engineer in the design of such tunnels. (See also W77-10334). (Sims-ISWS)
W77-10333

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VIII. PILE FOUNDATIONS AND SHEET PILE CELLS,
Army Engineer Div. Southwestern, Dallas, Tex.
B. H. James, T. J. Mudd, T. Gaddie, and H. Gray.
Volume 8 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 74 p, 38 fig, 2 tab, 35 ref, 2 append. N. Radhakrishnan, editor.

Descriptors: *Piles(Foundations), *Cofferdams, *Sheet piling, Steel piles, Retaining walls, Structures, Engineering structures, Computer programs, Computer models, Foundations, Walls, Design, Structural design, Structural engineering, Hydraulic structures, Engineering, Civil engineering, Conferences.
Identifiers: *Computer-aided design.

Two papers were contained in this volume: PILE FOUNDATIONS - The state of the art concerning the design of pile foundations was presented. Topics presented include design philosophy, design methods, and the computer programs which are currently available for rigid structures. Selection of the preferred design method was made, giving consideration to types of structures for which they should be used. Recommendations also were made concerning the adoption of a standard computer program for Corps-wide use. CELLULAR SHEET PILE STRUCTURES - The first cellular cofferdam, constructed of sheet steel piling, was built in 1909. the cellular sheet pile construction technique is still most commonly used for cofferdams. Other applications are fixed crest dams and weirs, navigation lock walls, mooring cells, retaining walls, and substructures for concrete gravity superstructures. The most common configurations for cellular sheet pile structures are circular cell, diaphragm, and cloverleaf. The circular cell type is preferred for construction in river currents. Diaphragm-type cells are economical for moderate height structures in still water. Where there is no room for stability berms and large cells are needed for stability, the cloverleaf configuration is practical. (See also W77-1033) (Sims-ISWS)
W77-10334

PUBLIC LAW ALLOWS MITIGATION OF SHORE EROSION DAMAGE BY CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washington, D.C. Construction Operations Div.
For primary bibliographic entry see Field 6E.
W77-10450

MAPS OF SHORE AND NEARSHORE STRUCTURES, SHORE AND BLUFFLINE POSITIONS, THE 100-YEAR ANTICIPATED RECESSION LINE AND SHORE OWNERSHIP,
Illinois State Dept. of Transportation, Chicago. Div. of Water Resources.
For primary bibliographic entry see Field 2J.
W77-10506

MAN-MADE GEOTHERMAL ENERGY SOURCE USES OIL-FIELD KNOW-HOW.
Oil and Gas Journal, Vol 75, No 29, p 59, July 18, 1977.

Descriptors: *Thermal power, *Deep wells, *Geothermal studies, Drilling, New Mexico.
Identifiers: Hydraulic fracturing.

Modified oil-well drilling and fracturing techniques have been used by the Los Alamos, New Mexico, Scientific Laboratory to create a man-made geothermal energy source. The system involves two holes drilled almost 2 miles deep that are separated at the surface by about 250 feet. A heat exchange surface of rock with a temperature of about 400 degress F was exposed via hydraulic fracturing and development of a network of cracks. Water pumped downhole at 900-1000 psi circulates through the crack system and flows from the second hole at 265 degrees F. Back pressure is applied to the second hole to prevent water from boiling until pressure is released at the surface. (Eberle-NWWA)
W77-10515

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5D.
W77-10591

PVC SEWER PIPE SURVIVES DEEP BURIAL.
For primary bibliographic entry see Field 8G.
W77-10592

8B. Hydraulics

BUOYANT SURFACE DISCHARGE AND SMALL-SCALE OCEANIC FRONTS: A NUMERICAL STUDY,
Catholic Univ. of America, Washington, D.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W77-10104

INCIPIENT TRANSPORT OF FINE GRAINS AND FLAKES BY FLUIDS-EXTENDED SHIELDS DIAGRAM,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W77-10116

EVOLUTION OF MULTIJET SLEEVE VALVE,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 8C.
W77-10117

PROPORTIONAL WEIRS AS VELOCITY CONTROLLING DEVICES,
Indian Inst. of Science, Bangalore. Dept. of Civil Engineering.
L. Rao, N. S. Rao, and D. Chandrasekaran.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 13016, p 633-648, June 1977. 5 fig, 2 tab, 10 ref, 2 append.

Descriptors: *Weirs, *Velocity, *Canals, Discharge coefficient, Sedimentation, Sediment control, Orifices, Settling basins, Settling velocity, Hydraulics.
Identifiers: *Proportional weirs, Velocity controlling devices, Settling chambers.

Of the many factors that govern the settling phenomenon, the flow velocity in the settling tanks can be controlled favorably by fixing suitably designed weirs at the outlets of the tanks. The velocity at the bottom should not dislodge the particles that have already settled. The requirements might be met by velocities which are controlled to be constant with respect to the depth of flow, or by velocities which reduce linearly with increasing depth or velocities that vary inversely with the depth. To achieve these types of velocity control, new proportional weirs were designed. Very near to the outlet of the tank, over a small length, the flow was found to be turbulent and noncompliant with the expected type of velocity control. This small length of the disturbance may be provided over and above the theoretical settling length of the tank for efficient sedimentation. (Lee-ISWS)
W77-10118

ON THE PROBLEM OF FLUID FLOW UNDER A SLUICE GATE,
California Univ., Berkeley. Dept. of Mechanical Engineering.
D. A. Caulk.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 778, Price codes: A03 in paper copy, A01 in microfiche. AM-76-3, June 1976. 24 p, 1 fig, 14 ref, 1 append. ONR N00014-76-C-0474.

Descriptors: *Sluice gates, *Supercritical flow, *Froude number, *Hydraulic jump, Steady flow, Mathematical studies, Free surfaces, Hydraulics, Energy equation, Flow.
Identifiers: *Inviscid fluid, *Conformal mapping, Two-dimensional theory.

The flow of an inviscid, incompressible fluid under a sluice gate was concerned. The problem was approached on the basis of the two-dimensional theory of a directed fluid sheet developed recently by Green, Laws, and Naghdi. In the context of this theory, the appropriate jump conditions at the sluice gate were discussed, and the exact solution was obtained for the region on each side of the gate. Also discussed was the relationship of the solution obtained to previous treatments of the same problem. (Singh-ISWS)
W77-10134

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VI. GATES, STOP LOGS, AND TRASHRACKS,
Office of the Chief of Engineers (Army), Washington, D.C. Structural Section.
For primary bibliographic entry see Field 8C.
W77-10135

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME IX. SHEET PILE WALLS AND T-WALLS,
Army Engineer District, New Orleans, Louisiana. Design Branch.
W. D. Judlin, III, and R. Veselka.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-031251, Price Codes: A04 in paper copy, A01 in microfiche. Volume 9 of the Proceedings of a Conference held September 22-26, 1975, New Orleans, Louisiana. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 57 p, 9 fig, 5 append. N. Radhakrishnan, editor.

Descriptors: *Walls, *Retaining walls, *Levees, *Sheet piling, Structures, Engineering structures, Computer programs, Computer models, Design, Structural design, Structural engineering, Hydraulic structures, Engineering, Civil engineering, Conferences.
Identifiers: *Computer-aided design, T-walls.

Two papers were contained in this volume: SHEET PILE WALLS -Cantilever and tieback sheet pile walls can be used for retaining walls and floodwalls. A cantilever sheet pile wall is a continuous diaphragm of interlocking sheet piling supported against lateral loads only by the soil around it. A tieback sheet wall has the same components and is supported by the surrounding soil and exterior supports. The two types of sheet pile walls were compared for suitability in various applications. Earth pressure design methods (free earth support and fixed earth support) and the flexible soil support method were compared. The design techniques are all suitable for computer applications. A listing of available computer programs was included. INVERTED T-TYPE FLOODWALLS AND CANTILEVER T-TYPE RETAINING WALLS - Corps of Engineers criteria for the design/analysis of inverted T-type reinforced concrete cantilever floodwalls and retaining walls were summarized. A list of all T-wall computer programs in use throughout the Corps of Engineers was enclosed. CADSE Conference discussions concerning inverted T-type walls were summarized. (See also W77-10135) (Sims-ISWS)
W77-10136

RURAL DOMESTIC WATER SYSTEM PEAK FLOWS AND DESIGN INNOVATIONS,
Utah Water Research Lab., Logan.
T. C. Hughes, Y. Kono, and R. Canfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 671, Price codes: A04 in paper copy, A01 in microfiche. Utah Water Research Laboratory Publication PRJER-030-3, January 1977. 50 p, 15 fig, 12 tab, 30 ref, 5 append. OWRT A-030-UTAH(1).

Descriptors: *Water supply, *Rural areas, *Peak runoff, Orifices, Design standards, Planning, Domestic water, *Utah, Flow rates, Water demand, Demand, Measurement, Plastic pipes.
Identifiers: Hydraulic friction.

Planning engineers commonly use generous factors of safety for peak flow estimates in urban water supply systems both as a hedge against unforeseen growth and because economies of scale result in relatively low user costs even with such reserve capacity. Transplanting of such design criteria into the rural setting, however, does not work. The low density portions of rural domestic systems require very realistic design criteria or the construction costs become infeasible for the small number of customers involved. Peak instantaneous flow rates in a Utah rural system were measured continuously during two summers on three dead-end lines serving various numbers of customers. The second summer included measurement of flows to customers whose maximum flow rate was limited by a simple orifice placed in each meter. Conclusions which emerged from this study included: (1) Actual peak demands were lower than those required for design purposes by some state regulatory agencies, but higher than the Farmers Home Administration minimum standard. (2) Where extremely small mains are required by the economics of low density situations, or where unforeseen growth is overtaxing system capacity, peak demands can be cut significantly by simple, flow restricting devices at each meter without decreasing the quality of water service to the customer. (3) Field measurements of head loss through 10 year old plastic pipe indicated a Hazen Williams friction factor average of 133.
W77-10176

A COASTAL ENGINEERING STUDY OF INDIAN RIVER INLET, DELAWARE,
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
G. A. Lanan, and R. A. Dalrymple.
Sea Grant Technical Report No. DEL-SG-5-77 and Ocean Engineering Technical Report 14, (1977). 239 p, 86 fig, 14 tab, 73 ref, 2 append.

Descriptors: *Delaware, *Inlets(Waterways), *Erosion, *Littoral drift, *Coastal engineering, Sedimentation, Sand bypassing, Sediment transport.
Identifiers: *Indian River Inlet(Del).

A field study was conducted in order to determine the causes of and possible solutions to various coastal engineering problems at Indian River Inlet, Delaware. The stabilization of the inlet in 1938 has interfered with the natural littoral processes. The major problems present at Indian River Inlet are the erosion of the beach north of the inlet, the erosion of the inlet channel banks, and the loss of sand onto the ebb tidal shoal. Information on sediment movement trends was obtained by computing volumes of erosion and accretion from historical charts and conducting a series of three hydrographic surveys. The sediment movement patterns were documented with a sand tracer study. The tidal hydraulics of Indian River Inlet were also studied through tidal and current measurements. The conclusions of this study also include an approximate sand budget. The net annual littoral drift at Indian River Inlet was determined to be approximately 105,000 cubic yards northward. The study of various sand bypassing techniques indicated that sand bypassing would be a feasible solution of several of the problems presently being experienced at Indian River Inlet. The bulkheading of the unprotected portions of the channel banks is also recommended. (NOAA)
W77-10189

A MATHEMATICAL MODEL FOR TRANSIENT OPEN CHANNEL FLOW: A WATER RESOURCE PLANNING AND MANAGEMENT TOOL,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 2E.
W77-10290

END DEPTH UNDER ZERO-INERTIA CONDITIONS,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
T. Strelkoff, and N. Katopodes.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13053, p 699-711, July 1977. 5 fig, 4 ref, 2 append.

Descriptors: *Open channel flow, *Model studies, *Flood routing, Hydraulics, Dimensional analysis, Surface irrigation, Flow profiles, Equations, Mathematical studies.
Identifiers: End depth, Kinematic wave theory, Irrigation-water flow, St. Venant equation, Lake discharge problem, Zero-inertia conditions.

The terminal depth and velocity conditions for flow in an open channel ending in a free overfall were investigated under the assumption that inertial effects are everywhere negligible. When inertial terms are retained, as in the Saint-Venant or varied-flow equations, the terminal conditions are

both at critical. When not only the inertial terms but also the depth-gradient term are dropped, depth and velocity at the brink of the overfall are at normal. Under the zero-inertia assumption, end depth is found to be zero and the velocity correspondingly infinite. This notion was tested in a series of steady-flow comparisons with results obtained from the varied-flow equation. The results of a zero-inertia assumption lie close to those of the varied-flow equation when the flow conditons are characterized by low Froude numbers. In application to the problem of discharge from a lake into a channel ending in an overfall, the traditional trial-and-error solution is replaced by a new direct solution read off from a graph. (Lee-ISWS)
W77-10302

MODEL STUDIES OF DENVER WHITEWATER CHANNEL,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. P. Simmons, T. H. Logan, R. A. Simonds, and R. J. Brown.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13080, p 763-775, July 1977. 9 fig, 1 tab, 1 ref, 1 append.

Descriptors: *Recreation facilities, *Open channel flow, *Model studies, *Colorado, Channels, Open channels, Channel flow, Hydraulic models, Boating, Gates, Control structures, Recreation, Water sports, Wild rivers, Streamflow, Hydraulics.
Identifiers: *Whitewater channels, *Denver(Colo).

Hydraulic model studies on a scale of 1:20 were described for a 500 ft-long (152-m) whitewater kayak and boating channel with a 6 ft (1.8-m) drop. Details of site conditons, hydraulic criteria, model construction, testing, measurement, and the development of the channel configurations were reviewed. The recreational whitewater channel will vary from 25 ft - 40 ft (7.6 m - 12.2 m) in width, have minimum flow depths of 2 ft - 3 ft (0.6 m - 0.9 m) and operate at discharges from 150 cfs - 320 cfs (4.2 cu m/s - 9 cu m/s). The selected inlet control gate structure was described, as well as the steps taken to make the channel a safe recreational facility. The boating channel was proposed for construction on the South Platte River in Denver, Colorado. (Sims-ISWS)
W77-10304

SPEED OF INERTIAL BED LOAD DISTURBANCES,
Central Water and Power Research Station, Poona (India).
K. Padmavally.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY7, Proceedings Paper 13072, p 777-795, July 1977. 7 fig, 14 ref, 4 append.

Descriptors: *Flow, *Bed load, *Velocity, Dunes, Erosion, Fluid mechanics, Shear stress, Waves(Water), Hydrology, Streambeds, Sediment transport, Channel flow.
Identifiers: *Bed load movement, Propagation, Bed load discharge.

The flow of water on a movable bed was studied by the method of characteristics. The equations of motion and continuity for water and bed load were considered separately. A relation between the velocity of propagation of a slight disturbance in the rate of bed load transport and the average bed load velocity was obtained. Also, the possibility was indicated of the existence of more than one velocity of propagation for 'bed forms' or disturbances in the static bed level. A method of approximate numerical solution of the flow equations was given. (Lee-ISWS)
W77-10305

CHANNEL SILTATION DETERMINED WITH SIDE-SCAN SONAR,
Army Engineer District, Portland, Oreg. Dredging Operations Div.
G. L. Hartman.
Civil Engineering-American Society of Civil Engineers, Vol. 47, No. 6, p 71-73, June 1977. 1 fig.

Descriptors: *Remote sensing, *Sonar, *Silting, *Dredging, *Oregon, Sediments, Sedimentation, Estuaries, Depth, Hydrography, On-site investigations, Monitoring, Sediment transport, Channels, Cross-sections, Civil engineering.
Identifiers: *Side-scan sonar, *Coos Bay(Ore), Water depth.

Of the new electronic means to measure water depth, side-scan sonar is unusual in that it gives not only a cross section of the bottom but also a semi-3-D picture of the bottom surface. Experienced analysts can identify small-scale features like ripples and exposed rock, and sometimes even the type of bottom sediments. The technique can be used productively in conjunction with core borings, one to survey broad areas and the other to get detailed information at selected spots. Sediment transport and dredging activity can be monitored by the technique. A case history of use of the technique at Coos Bay, Oregon, was given. (Sims-ISWS)
W77-10315

AUTOMATED HYDROGRAPHY FOR CHANNEL DREDGING,
Army Engineer District, Philadelphia, Pa. Survey Branch.
H. R. Spies.
Civil Engineering-American Society of Civil Engineers, Vol. 47, No. 6, p 73-75, June 1977. 2 fig.

Descriptors: *Automation, *Delaware River, *Hydrography, *Instrumentation, Surveys, Remote sensing, Channels, Depth, *Dredging, Rivers, Beds, Cross-sections, On-site investigations, On-site data collections, Estuaries, Civil engineering.
Identifiers: Water depth.

After studying both non-line of sight and microwave systems of overwater distance measurement, one of the microwave systems was selected for checking dredged channel depth on the Delaware River. Horizontal position of a survey boat is so automated that the survey boat's position can be determined once each second. Another display showed water depth at that location, so whether or not dredging is needed on the river channel leading to Philadelphia can be determined rapidly. (Sims-ISWS)
W77-10316

BREAKING WAVES,
Institute of Oceanographic Sciences, Wormley (England).
E. D. Cokelet.
Nature, Vol. 267, No. 5614, p 769-774, June 30, 1977. 8 fig, 81 ref.

Descriptors: *Waves(Water), *Ocean waves, *Surf, *Model studies, Mathematical models, Beaches, Shores, Oceans, Fluid mechanics, Computer models, Energy, Deep water, Shallow water, Oceanography.
Identifiers: *Breaking waves.

Breaking waves, both whitecaps and surf, commonly are observed in the ocean, but surprisingly little is known about them. Yet, they are important for a variety of reasons. Breaking waves place large hydrodynamic loads on man-made structures, transfer horizontal momentum to surface currents, provide a source of turbulent energy to mix the upper layers of the ocean, move sediment in shallow water, and enhance the air-sea exchange of gases and particulate matter. More than a hundred years of mathematical studies still leave some aspects of breaking waves unanswered, although much is now understood about the processes leading up to breaking and the period after breaking has occurred. (Sims-ISWS)
W77-10317

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VII. SINGLE- AND MULTICELL CONDUITS AND TUNNELS,
Army Engineer District, Tulsa, Okla.
For primary bibliographic entry see Field 8A.
W77-10333

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VIII. PILE FOUNDATIONS AND SHEET PILE CELLS,
Army Engineer Div. Southwestern, Dallas, Tex.
For primary bibliographic entry see Field 8A.
W77-10334

HYDRAULIC DESIGN DATA FOR WATER WELLS IN UNCONSOLIDATED SEDIMENTS,
New South Wales Univ., Kensington (Australia). Water Research Lab.
C. R. Dudgeon, and R. J. Cox.
Australian Water Resources Council Technical Paper No. 22, 1977. 88 p, 54 fig, 6 tab, 6 ref.

Descriptors: *Water wells, *Design data, *Unconsolidated aquifers, Groundwater movement, Drawdown, Water yield, Sediments, Australia, Finite element analysis.

Rational design of a water well to be constructed at a given point in an aquifer requires prediction of the drawdown-discharge relationship for each type of construction and geometrical configuration under consideration. Once this prediction is possible, alternative designs may be compared and the optimum chosen. Information is presented on the effects of design variables on the drawdown-discharge relationship for a range of conditions selected on examination of records of wells constructed in unconsolidated sedimentary aquifers in eastern Australia. The data provided are based on finite element digital computer programs used to analyze flow conditions in close proximity to wells. These have been verified as far as possible by comparison with known analytical solutions and electrical analogue and experimental tank results. (CSIRO)
W77-10377

WELL MAINTENANCE AND REHABILITATION,
National Water Well Association, Worthington, Ohio.
J. H. Lehr.
Water Well Journal, Vol. 31, No. 8, p 8-9, August, 1977.

Descriptors: *Water wells, *Rehabilitation, *Maintenance.
Identifiers: Incrustation.

A significant contribution that the ground water industry can make toward conservation of natural and economic resources lies in the sphere of water well maintenance and rehabilitation. Increasing costs, scarcity of materials, and threats to the purity of the nation's aquifers demand an all-out effort to extend the lives of existing wells instead of abandoning hundreds of feet of casing to deteriorate in the ground and ultimately pollute the subsurface. It is possible today to restore many old wells to 95% of their original design capacity through well rehabilitation, however, industry wide expertise in such techniques is lacking. The National Water Well Association is initiating a project supported by an EPA grant, to amass well maintenance and rehabilitation data and to produce a manual of rehabilitation technology.

The result will be a guide and text dealing primarily with application and methodology as opposed to theory, with special emphasis on procedures for diagnosing the failures of individual wells. 'New' types of well such as those used in energy production, freshwater or waste water recharge, underground heat storage, etc., will also be discussed. (Eberle-NWWA)
W77-10516

NEW INSTRUMENT EXPANDS WATER WELL TECHNOLOGY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W77-10521

PUMPING TESTS PROVIDE USEFUL DATA, PART II,
Universal Oil Products, St. Paul, Minn. Johnson Div.
T. L. Johnson.
Johnson Drillers Journal, Vol 49, No 3, p 8-12, May-June, 1977. 5 fig.

Descriptors: *Water wells, *Drawdown, *Transmissivity, *Storage coefficient, Aquifer characteristics, Boundaries(Surfaces), Water levels, *Pumping.

Data analysis discussed is done via the modified, non-equilibrium formula, or Jacob's method. Values are plotted on semi-logarithmic paper and form a straight line, thus greatly simplifying the formulas and calculations used in determining the transmissivity and storage coefficient on the aquifer. A best-fitting line is drawn for the plot of elapsed time versus drawdown from which change in drawdown over one logarithmic cycle can be read, as well as the point in time that the plotted line intersects the line of zero drawdown. Transmissivity and coefficient of storage can then be computed. Special care must be taken when fitting the line for a pumping test during which barrier or recharge boundary effects are encountered. Once transmissivity and storage coefficient have been determined, specific capacity and well efficiency can be calculated through manipulation of the equations in this article and constructing distance-drawdown curves. Interference between wells can also be determined. (See also W77-08658) (Eberle-NWWA)
W77-10530

CONSTRUCTION OF A LARGE DIAMETER WELL,
R. B. McDannald.
Water Well Journal, Vol 31, No 6, p 36-37, June, 1977. 10 fig.

Descriptors: *Water wells, *Water yield improvement, Drilling, Drill holes, Well casings.

A 58 foot 5 inch diameter shale well with shale starting at 7 feet yielded only 30 gal. per hour and could not support the water demands of the family of the new well owner. This photoessay illustrates the steps taken to convert the well to an unconventional but effective system. The existing well served as a pilot hole for a 30 inch augered bore, subsequently counterbored to 36 inches to accommodate casing (30 inch 12 gauge culvert pipe). The completed enlargement produces 3 gpm and has a reservoir of 1950 gallons to act as a buffer between high usage periods. (Eberle-NWWA)
W77-10531

HEAT TRANSFER CHARACTERISTICS OF MELTING AND REFREEZING A DRILL HOLE THROUGH AN ICE SHELF IN ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H. Physical Sciences Branch.
For primary bibliographic entry see Field 2C.
W77-10655

PREDICTION OF VELOCITY DISTRIBUTION IN A VORTEX TUBE SEDIMENT TRAP WITH TURBULENCE MODELS,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4D.
W77-10657

SEQUENT PEAK PROCEDURE: MINIMUM RESERVOIR CAPACITY SUBJECT TO CONSTRAINT ON FINAL STORAGE,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 4A.
W77-10781

ANALYTICAL EVALUATION OF TECHNIQUES FOR USE OF A LASER DOPPLER VELOCIMETER TO MEASURE FLOW AND TURBULENCE,
Colorado State Univ., Fort Collins. Dept. of Physics.
For primary bibliographic entry see Field 2E.
W77-10784

MODELING OF STREAM GEOMETRY AND ITS APPLICATIONS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-10791

DETERMINISTIC AND STOCHASTIC APPROACHES FOR MODELLING OF LONGITUDINAL DISPERSION IN A TURBULENT OPEN CHANNEL FLOW,
Ecole Polytechnique, Montreal (Quebec). Dept. of Mathematics.
For primary bibliographic entry see Field 5B.
W77-10794

8C. Hydraulic Machinery

EVOLUTION OF MULTIJET SLEEVE VALVE,
Southern California Metropolitan Water District, Los Angeles.
W. W. Watson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY6, Proceedings Paper 13006, p 617-631, June 1977. 17 fig, 1 tab, 10 ref, 2 append.

Descriptors: *High pressure valves, *Hydraulicvalves, *On-site tests, *Design data, Pressure, Regulated flow, Water distribution(Applied), Equipment, Hydraulics, Regulation, Flow control, Jets, Gates, Sealants.
Identifiers: *Sleeve valves.

Described herein were the different types of multijet sleeve valves that have evolved, the experience that has been gained in the operation of the valves, the various problems, and the modifications made to solve the problems since the development of the multijet sleeve valve in the early 1970's. A table was presented giving various design data for selected multijet sleeve valve flow and pressure control structures that are in use or under construction. Also, the valve design standards and operator thrust formula were given, with a plot of nozzle diameter vs. tank size as a function of valve head loss. The multijet sleeve valve has proven to be versatile, easily configured to match various hydraulic operating conditions, and dependable. The valve also has met the original design parameters of cavitation free operation, low noise, and vibration levels. (Humphreys-ISWS)
W77-10117

CORPS-WIDE CONFERENCE ON COMPUTER-AIDED DESIGN IN STRUCTURAL ENGINEERING. VOLUME VI. GATES, STOP LOGS, AND TRASHRACKS,
Office of the Chief of Engineers (Army), Washington, D.C. Structural Section.
K. O'Donnell,, W. D. Churchill, L. E. Sell, and J. D. Gibson, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD/A-031248, Price Codes: A03 in paper copy, A01 in microfiche. Volume 6 of the Proceedings of a Conference held September 22-26, 1976, New Orleans, Louisiana. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, August 1976. 68 p, 23 fig, 13 ref, 6 append.

Descriptors: *Gates, *Trash racks, *Spillways, Roller gates, Radial gates, Spillway gates, Intake gates, Hydraulic gates, Structures, Check structures, Hydraulic structures, Computer programs, Computer models, Engineering structures, Engineering, Design, Civil engineering, Conferences.
Identifiers: *Computer-aided design.

Three papers were contained in this volume: TAINTER GATES FOR SPILLWAYS - The radial or tainter gate is the most common type of spillway crest gate used on dams. The Corps has constructed 800 in the last 15 years. Tainter gate advantages are simplicity, light weight, low hoist requirements, favorable hydraulics, and service and maintenance ease. Structural components for tainter gates are: skin plate assembly, end frames, trunnions, and anchorages. Several satisfactory programs for tainter gate design are available, but there is much duplication. The programs should be reviewed and tainter gate programs recommended for Corps-wide use. There are no programs available for designing prestressed concrete trunnion girders and anchorage systems; design programs should be developed for these items. WHEEL GATES, ROLLER GATES, AND TRASHRACKS - Design requirements presented in this paper are a consolidation of criteria published in Corp engineering manuals. The criteria are supplemented by the documentation of field problems that need consideration for future designs. A simple trash structure is required at the upstream end of a reservoir outlet to keep trees and other large trash from entering the gate passages. Roller, wheel, and slide gates are the types of vertical lift gates most commonly used by the Corps. Design procedures must allow for design head, discharge capacity, vibration, load selection, closing forces, corrosion protection, and the potential for gate catapulting. There are no published programs for a complete gate design. Gate computations are relatively brief, and District-level programming has not been economically feasible. MITER GATES AND STOP LOGS - Miter gates for navigation locks fill and empty the lock chamber and provide walkways across the locks. Double-leaf miter gates, quickly opened and closed and low in maintenance costs, are usually chosen for moderate-and high-lift locks. Computer programs can be easily adapted to the simple stop log design requirements. Several programs not specifically tailored for stop log design requirements. Several programs not specifically tailored to stop log design have been adapted for this use. (See also W77-10136) (Sims-ISWS)
W77-10135

THE APPLICATION OF ULTRASONIC LIQUID FLOW MEASUREMENT TO THE WATER AND WASTE WATER CONTROL INDUSTRY,
J. B. Orknew.
Municipal Engineer, Vol. 7, No. 1, p 89-90, 1976. 1 fig.

Descriptors: *Ultrasonics, *Flow measurement, Water quality control, Equipment, Monitoring, Flow, *Waste water treatment.
Identifiers: South Africa, *Ultrasonic flowmeters.

The author discusses the Ultrasonic Flow Monitor UFM-200 and its application in measuring and recording liquid flow accurately and reliably with no maintenance. (So African Water Info Center)

W77-10219

COMPUTER APPLICATIONS TO ACHIEVE OPTIMUM ECONOMIC LOADING OF GENERATING PLANTS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 6A.
W77-10288

DOWN-HOLE MUD MOTOR PASSES FIELD TEST.
Oil and Gas Journal, Vol. 75, No. 30, p 101, July 25, 1977. 1 fig.

Descriptors: *Rotary drilling, *Drilling equipment, Drilling fluids, Wells, Mud, Oil industry.
Identifiers: *Downhole mud motors.

The feasibility of a positive-displacement design downhole mud motor was recently demonstrated in an oil well drilling test in Louisiana. The motor, developed by Allegheny-Ludlum Industries, performed successfully while drilling a 1000-foot vertical interval in 22 hours. This rate (47 feet/hour) is comparable to conventional drilling rates. Previous mud motors or turbines have required the use of diamond bits because of their high rotation rate; the low rotation rate of this motor, combined with its high-capacity thrust bearing assembly, offers drillers the chance to put more horsepower downhole, using standard mill-tooth bits. Torque exerted by the motor is directly related to fluid input pressure. The positive displacement feature prevents stalling at low flow rates. (Eberle-NWWA)
W77-10514

HERE COMES THE SUN.
Ground Water Age, Vol. 11, No. 10, p 25, 26, 56, June, 1977. 3 fig.

Descriptors: *Irrigation engineering, *Pumping, *Energy, Irrigation systems, Irrigation design, Solar radiation, *Arizona.
Identifiers: *Solar collectors, Rankine cycle turbines.

The world's largest solar powered irrigation system is now in operation at Gila Bend, Arizona. The system, developed by the Columbus Laboratories of Batelle Memorial Institute, includes a 50 h.p. pump capable of delivering up to 10,000 gallons of irrigation water per minute at peak operation. Water under pressure is pumped into solar collectors, heated to a high temperature, and routed to a boiler where it heats liquid Freon until it changes to gas. The gas, in turn, drives a Rankine cycle turbine which operates the irrigation pump. During the longest days of the year, the system can deliver up to 5.6 million gallons of water in less than 10 hours. While there is presently no provision for energy storage to allow for longer periods of operation, this feature can be incorporated if desired. (Eberle-NWWA)
W77-10518

SUBMERSIBLE PUMPS SPEED SEWAGE FLOW,
For primary bibliographic entry see Field 5D.
W77-10587

HOW ACCURATE ARE SHOP-MADE ORIFICE PLATES,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 3F.
W77-10782

8D. Soil Mechanics

DRAWDOWN ANALYSIS OF SLOPES BY NUMERICAL METHOD,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
C. S. Desai.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol 103, No GT7, Proceedings Paper 13054, p 667-676, July 1977. 10 fig, 2 tab, 8 ref, 2 append.

Descriptors: *Finite element analysis, *Safety factors, *Dewatering, *Slope stability, *Reservoir stages, *Bank stability, Numerical analysis, Slopes, Seepage, Reservoirs, Embankments, Soil mechanics, Design criteria, Water table, Drainage, Earthworks.

A numerical procedure was used to analyze slopes subjected to transient free surface seepage. The procedure combined a finite element scheme with a method of slope-stability analysis. The finite element scheme allows computations of time dependent locations of free surface, and the stability analysis method permits computation of factor of safety. The final results were plotted in charts expressed through a number of nondimensional quantities. It was found that the value of the lowest factor of safety by the proposed procedure is approximately equal to that from the conventional assumption of sudden drawdown. The procedure can lead to more economical design if the designer can adopt drawdown ratios less than unity. The numerical procedures can provide an improved understanding of the behavior of slopes during transient drawdown conditions. (Adams-ISWS)
W77-10776

STABILIZATION OF POTENTIALLY LIQUEFIABLE SAND DEPOSITS USING GRAVEL DRAINS,
California Univ., Berkeley. Dept. of Civil Engineering.
H. B. Seed, and J. R. Booker.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol 103, No GT7, Proceedings Paper 13088, p 757-768, July 1977. 8 fig, 12 ref, 2 append.

Descriptors: *Computer programs, *Sands, Stabilization, *Foundations, *Drainage systems, Drainage, Soil mechanics, Pore pressure, Quick sand, Earthquakes, Vibrations, Theoretical analysis, Permeability.
Identifiers: *Liquefaction.

The installation of a drainage system offers an attractive and economical procedure for stabilizing an otherwise potentially liquefiable sand deposit. Such a procedure has already been used in one case involving the construction of stone columns in a relatively loose sand deposit, and it is being proposed for stabilization of a medium dense sand layer. The paper presented a simplified theory that provides a convenient basis for evaluating the possible effectiveness of a drain system in such cases. Where appropriate, additional analyses may be made readily using a computer program based on the theory presented, but for most practical cases, it is believed that the charts presented in the paper will provide for effective stabilization of potentially liquefiable sand deposits. (Adams-ISWS)
W77-10777

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, COLUMBIA LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
For primary bibliographic entry see Field 8G.
W77-10783

8E. Rock Mechanics and Geology

MAN-MADE GEOTHERMAL ENERGY SOURCE USES OIL-FIELD KNOW-HOW.
For primary bibliographic entry see Field 8A.
W77-10515

8F. Concrete

AUXILIARY CEMENTING MATERIALS CONTRIBUTE TO SUCCESSFUL JOBS,
Western Co., Houston, Tex.
P. Parker, and C. Clement.
Oil and Gas Journal, Vol. 75, No. 21, p 80-84, May 23, 1977. 15 fig, 1 tab.

Descriptors: *Rotary drilling, *Cement grouting, *Cements, Drilling fluids, Drilling equipment, Well casings, Slurries.
Identifiers: Centralizers, Cementing plugs, Cementing shoes, Float collars, Cementing heads, Mud removal.

A variety of mechanical equipment is used in oil well cementing to insure reliable bonding. Centralizers, mechanical spacers which fit on the outside diameter of a casing string, center the string in the hole in order that cement can be placed evenly on all sides of the pipe. Scratchers made of wire or cable can be fastened on to casing like a collar to help scour the hole wall as casing is being run, removing the drilling fluid's residual filter cake and thus permitting a better formation bond. Cementing shoes, plugs, float collars, and stage tools are among the other necessary pieces of equipment involved in cement placement. Proper utilization of these items is essential for adequate removal of drilling muds from the hole and for obtaining a pressure-tight seal between pipe and formation. (Eberle-NWWA)
W77-10524

CEMENTING OIL AND GAS WELLS, PART 4,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.
World Oil, Vol 184, No 7, p 69-77, June, 1977. 15 fig, 3 tab, 33 ref.

Descriptors: *Cements, *Drilling fluids, *Rotary drilling, Flow characteristics, Mud, Slurries, Fluid friction, Laminar flow, Turbulent flow, Viscosity, Pressure, Well casings.
Identifiers: Plug flow, Centralizers, Standoff rings.

In order to adequately displace drilling fluids during well cementing jobs, due consideration must be given to drag forces of both fluid and cement slurry, formation characteristics, and flow properties of the cement. Determination of the proper cement makeup, flow velocity, and pumping pressure is complex because of the non-Newtonian fluid characteristics of drilling muds and cements, i.e., such fluids can exhibit plug, laminar, or turbulent flow depending upon the combination of fluid properties and placement pressures employed. Several flow equations are provided for determining annular velocity of slurries, and suggestions are presented for cement makeup for certain anticipated flow conditions. Advantages of well casing rotation and use of auxiliary casing devices (centralizers, scratchers, standoff rings, etc.) are listed in some detail. Several cautions regarding formation damage or circulation loss during cementing are also presented. (See also W77-07697, W77-08327, W77-08328 and W77-10529) (Eberle-NWWA)
W77-10528

CEMENTING OIL AND GAS WELLS, PART 5,
Completion Technology Co., Houston, Tex.
G. O. Suman, Jr., and R. C. Ellis.

World Oil, Vol 185, No 1, p 117-125, July, 1977. 8 fig, 11 ref.

Descriptors: *Cements, *Rotary drilling, *Drilling equipment, Well casings, Slurries, Boreholes, Density.
Identifiers: Guide shoes, Float collars, Centralizers, Scratchers, Cementing heads, Stage collars.

Previous articles in this series have presented basic principles of hole preparation, casing handling, cement slurry chemistry and additive selection, and described how drilling mud is displaced by the cement slurry. This installment discusses downhole and surface equipment used in conventional cementing. Concepts and applications of such equipment on casing strings are explained. A discussion is included of stage cementing, mixing and density measuring devices, and the process of cementing large diameter casing by the stab-in method. (See also W77-07697, W77-08327, W77-08328 and W77-10528) (Eberle-NWWA)
W77-10529

STRAIN METERS AND STRESS METERS FOR EMBEDMENT IN MODELS OF MASS CONCRETE STRUCTURES; REPORT 2, EVALUATION OF MICRODOT EMBEDMENT STRAIN GAGE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
For primary bibliographic entry see Field 8G.
W77-10785

8G. Materials

FIELD EVALUATION OF 102-MM (4-INCH) CORRUGATED POLYETHYLENE TUBING,
Soil Conservation Service, Broomal, Pa. Dept. of Water Management Engineering.
D. E. McCandless, Jr.
Transactions of the American Society of Agricultural Engineers, Soil and Water, p 514-516, Special Edition 1976. 7 tab, 3 ref.

Descriptors: Drainage, Drainage engineering, *Drainage practices, *Tubes, *Irrigation, Conveyance structures.
Identifiers: *Polyethylene tubing, Elongation.

A field evaluation of the physical condition of installed 102 mm (4 in.) corrugated polyethylene tubing was made in four states in the Northeast by the United States Department of Agriculture Soil Conservation Service. Elongation and deflection data were summarized on tubing from 54 sites. Deflections of 13 to 25 percent were typical, however seven sites had deflections greater than 35 percent. The tubing was elongated 4.2 percent on the average when installed with a wheel trenching machine. (Skogerboe-Colorado State)
W77-10172

MUD DESIGN TO MINIMIZE ROCK IMPAIRMENT DUE TO PARTICLE INVASION,
Shell Development Co., Houston, Tex.
A. Abrams.
Journal of Petroleum Technology, Vol 29, No 5, p 586-592, May, 1977. 8 fig, 10 ref.

Descriptors: *Drilling fluids, *Rotary drilling, *Porous media, *Damages, Mud, Pores, Permeability, Laboratory tests.
Identifiers: *Particle invasion, *Bridging materials.

Although invasion and formation damage occur with all muds during drilling, it is possible to minimize solids invasion and formation impairment by adding bridging material to the muds. Such bridging material is selected by matching its size to the formation rock pore size. Most research on drilling mud invasion to date has not included data on pore vs. particle size relationships; in this study, laboratory flow tests were performed on two different kinds of rock systems (radial, high-permeability unconsolidated sand, and linear, low-permeability dolomite) with the following results: (1) Muds containing bridging material with diameters equal to or greater than one-third the median pore size of the formation, at a concentration of at least 5 percent by volume of mud solids, impair rock to depths less than one inch. (2) Matching procedures based on calculation of the rock pore sizes from capillary pressure or permeability data can be used for selecting additives. Silica, calcium carbonate, wax, and asphalt solids are available in different size ranges and can be used for this application. (Eberle-NWWA)
W77-10513

NEW INSTRUMENT EXPANDS WATER WELL TECHNOLOGY,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. L. Mogg.
Johnson Drillers Journal, Vol. 49, No. 3, p 1-7, May-June, 1977. 9 fig, 3 ref.

Descriptors: *Water wells, *Drawdown, *Instrumentation, *Transmissivity, Aquifer characteristics, Rehabilitation, Water levels, Pumping, Specific capacity, Storage coefficient.
Identifiers: *Well efficiency, Incrustation.

Interest in obtaining accurate measurements from the very early parts of time-drawdown and recovery phases of pumping tests has led to the development of a portable water well analyzer with the capability of measuring a 100 foot range of drawdown accurately to 0.1 foot at 1.0 second intervals. Because conditions in the immediate vicinity of a well are reflected in the data obtained immediately after a pump is turned on or off, it was hoped that the analyzer's monitoring ability during these brief periods would allow the interpreting geologist to compute the efficiency or state of deterioration of a producing well. A study involving a plugged well for which the original specific capacity was known provided evidence that the water well analyzer is as accurate and useful as had been hoped. Inferences made from the pumping test data suggested a well treatment procedure which eventually restored the well under study to better than its original efficiency. (Eberle-NWWA)
W77-10521

AUXILIARY CEMENTING MATERIALS CONTRIBUTE TO SUCCESSFUL JOBS,
Western Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-10524

HOW TO IMPROVE DRILLING ECONOMICS BY USING A SHOCK ABSORBER,
Dresser Industries, Inc., Houston, Tex.
S. W. Worford.
Drilling-DCW, Vol 38, No 9, p 49, June, 1977. 2 fig.

Descriptors: *Rotary drilling, *Drilling equipment, *Construction costs, Vibrations, Oil wells.
Identifiers: Shock absorbers, Penetration rate.

A properly used shock absorber can improve rotary drilling economics by preventing bit and drill string damage as well as permitting increased penetration rate. Standard procedure for minimizing drill string vibration when it occurs is to reduce bit weight and rotary speed until more favorable drilling conditions are encountered; unfortunately, slower penetration and higher drilling costs are inevitable results. Running shock absorbers immediately above the bit allows the driller to apply more energy to the bit with much less vibration. In surveys comparing shock absorber systems to conventional systems in oil well drilling, total cost per foot has been uniformly lower for the former. As drilling expenses continue to swell, shock absorbers may be valuable tools for keeping drilling operations economical. (Eberle-NWWA)
W77-10526

HOW TO EXAMINE DIFFERENTIAL STICKING CHARACTERISTICS OF MUD,
E. Williams.
Drilling-DCW, Vol 38, No 9, p 46, June, 1977. 2 fig.

Descriptors: *Drilling, *Drilling fluids, *Laboratory tests, *Lubricants, Drilling equipment, Mud, Oil wells.
Identifiers: *Differential sticking, *Filter cakes, PAL Stickometer, Drill pipe.

Stuck pipe and tool fishing jobs are expensive problems in drilling operations world-wide. Techniques have now been developed to evaluate the sticking characteristics of water base drilling muds and to determine the effectiveness of lubricants in minimizing differential sticking problems. Lubricants have proved useful in countering the effects of filter cakes in permeable formations, however, environmental constraints now prohibit the use of diesel oil and other primitive lubricants once used in oil drilling operations. The 'Stickometer', manufactured by P.A.L., Inc., provides a means by which new synthetic lubricants can be evaluated and matched with muds to form workable combinations. Differential sticking conditions are simulated by the Stickometer, allowing the researcher to record mud conditions before sticking (mud weight, solids content, gel strength, etc.) as well as determine the torque necessary to move the Stickometer shaft when sticking occurs. (Eberle-NWWA)
W77-10527

CEMENTING OIL AND GAS WELLS, PART 4,
Completion Technology Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-10528

CEMENTING OIL AND GAS WELLS, PART 5,
Completion Technology Co., Houston, Tex.
For primary bibliographic entry see Field 8F.
W77-10529

PUMPING TESTS PROVIDE USEFUL DATA, PART II,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8B.
W77-10530

COLLECTION, TREATMENT AND REUTILIZATION OF WASTE WATERS IN ARID ZONES OF THE MIDDLE EAST,
Taylor (John) and Sons, London (England).
For primary bibliographic entry see Field 5D.
W77-10591

PVC SEWER PIPE SURVIVES DEEP BURIAL.
The American City and County, Vol. 92, No. 5, p 89-90, May, 1977.

Descriptors: *Pipes, *Sewers, Plastics, Construction materials, Pressure, Design criteria, Conduits, Conveyance structures, Loads(Forces), Joints(Connections).

Polyvinyl chloride (PVC) sewer pipe was successfully installed by Genge/Meurer, Serafini and Meurer, Incorporated, of Denver, Colorado, in a 42-foot deep trench. Proper bedding and control of the trench width were able to minimize deflection. The achievement of a 90% Standard Proctor Compaction or better around the sides of the pipe allowed transmission of the load from the pipe to the trench wall. The bedding also had to permit water

to percolate through to avoid deterioration and excessive deflection. A composite material or gravel with minimal sand and no clay was used as bedding. Washed rock was placed on the sides of the pipe and crushed rock with dirt and fine sand was used on top of the pipe. The project described used 15-inch diameter pipe in 12 1/2-foot sections. The pipe allowed easy and fast joint assembly. A Ring-Tite joint, made of a rubber ring seated in the ring groove of the pipe's bell end, was used. The joint, tight and leakproof, also allowed for deflection. The most severe deflection in the 2200-foot length of pipe was 3 1/2%. (Collins-FIRL)
W77-10592

PREVENTION OF SCALE FORMATION IN EVAPORATOR CHAMBERS (USTRANYAT' OBRAZOVANIE NAKIPI V KAMERAKH VYPARNOI STANTSII),
Krasnodarskii Politekhnicheskii Institut (USSR).
For primary bibliographic entry see Field 5D.
W77-10691

ANALYSIS OF DATA FROM INSTRUMENTATION PROGRAM, COLUMBIA LOCK,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Soils and Pavements Lab.
A. L. Sullivan, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-027 058, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper S-74-24, September 1974. 36 p, 16 fig, 7 ref.

Descriptors: *Locks, *Louisiana, *Instrumentation, *Load distribution, Loads(Forces), Pressure, Piezometers, Strain gages, Piles(Foundations), Bearing piles, Structures, Hydraulic structures, Engineering structures, Concrete structures, Backfill, Soil mechanics, Soil pressure, Settlement(Structural), Data processing, Civil engineering.
Identifiers: *Columbia Lock(La).

Three monoliths at Columbia Lock were instrumented and monitored during and after construction in order to determine the distribution of applied loads on the piles for comparison with predicted values. One of the monoliths was representative of the landside walls which support a backfill of compacted sand. One monolith was representative of the riverside walls which support no backfill. The instrumentation consisted of (1) bonded electrical strain gages for measuring axial loads on the piles, (2) earth pressure cells (landside monolith only) for measuring soil reaction, (3) piezometers, and (4) settlement plates and reference markers. Pressure cells indicated that the foundation soils carried only a small portion (approximately 5%) of the applied load. Practically all of the net applied load was carried by the foundation piles. For the landside monolith, the distribution of pile loads along each of the instrumented rows differed considerably from the planar distribution assumed for design. In general, the outer piles carried more load than the piles in the center. Analysis indicated that vertical drag forces resulting from settlement within the backfill had developed, accounting in part for the observed distribution of pile loads. (Sims-ISWS)
W77-10783

STRAIN METERS AND STRESS METERS FOR EMBEDMENT IN MODELS OF MASS CONCRETE STRUCTURES; REPORT 2, EVALUATION OF MICRODOT EMBEDMENT STRAIN GAGE,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Concrete Lab.
J. E. McDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 834, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 6-811, Report 2, July 1972. 41 p, 25 fig, 4 ref.

Descriptors: *Strain gages, *Testing, *Evaluation, Measurement, Concrete, Concrete structures, Structural models, Gages, Instrumentation, Stress, Structures, Strain measurement, Concrete testing, Civil engineering.
Identifiers: *Embedment strain gages.

To obtain information on the actual state of stress and/or strain within a concrete structure or model, it is of primary importance to make measurements in the interior of the structure or model. The main problem in model work is to obtain measuring devices small enough for embedment in a small-scale model. This report described the results of tests to evaluate the effectiveness of a small, bonded-metal embedment gage manufactured by Microdot, Incorporated. Due to its small size (2-in active gage length, 0.04-in diam), the gage can be embedded in relatively small-scale models, yet it appears large enough to give meaningful average readings within a heterogeneous material such as microconcrete. Because of its size, stability, and other desirable inherent qualities, the Microdot embedment gage appears suitable for use in measuring internal strains within models, provided an empirical calibration of the gage is made. (Sims-ISWS)
W77-10785

8I. Fisheries Engineering

THE REPRODUCTION OF BARBUS CF. KIMBERLEYENSIS (PISCES, CYPRINIDAE) IN THE HARDAP DAM, SOUTH WEST AFRICA,
Fort Hare Univ. (South Africa). Dept. of Zoology.
For primary bibliographic entry see Field 02H.
W77-10218

UNINTENTIONAL INTRODUCTIONS OF FISHES VIA HYDROELECTRIC POWER STATIONS AND CENTRIFUGAL PUMPS,
Albany Museum, Grahamstown (South Africa).
R. A. Jubb.
Journal of the Limnological Society of South Africa, Vol. 2, No. 1, p 29-30, 1976. 8 ref.

Descriptors: *Centrifugal pumps, *Hydroelectric power plants, Tailraces, Pumping, *Fish, Turbines, Fish migration.
Identifiers: South Africa, Victoria Falls, Lake Kariba, Zambesi River, Beitbridge Dam, Limpopo River.

Geographical and physical isolation barriers earlier considered impassable to fish fauna can be bypassed via hydro-electric power stations. Two possible routes exist at the Victoria Falls: down the header dam overflow or via the feed to the turbines. Observations prove that juvenile and small fishes can survive a passage through the turbines of large hydroelectric power stations. Unintentional introduction of fish from one water system to another by pumping is discussed. Juvenile fish have been proved to be more tolerant of sudden water pressure changes than adult fish. A list of the fish fauna in the Beitbridge dam is given. (So. African Water Info. Center)
W77-10225

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

COAL AND COAL MINE DRAINAGE, (LITERATURE REVIEW),
Bituminous Coal Research Inc., Monroeville, Pa.
For primary bibliographic entry see Field 05G.
W77-10355

A BIBLIOGRAPHY OF ESTUARINE RESEARCH IN OREGON,
Oregon State Univ., Corvallis. Sea Grant Coll. Program.
For primary bibliographic entry see Field 02L.
W77-10511

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Copper Toxicity Experiments in Relation to Abalone Deaths Observed in a Power Plant's Cooling Waters,
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ABSOLUTE LIABILITY
United States V Atlantic Richfield Company (Absolute Liability for Oil Spills Under Federal Water Pollution Control Act).
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W77-10144 5C

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W77-10145 5C

Indicators of Heavy-Metal Contamination in the Looe Estuary (Cornwall) with Particular Regard to Silver and Lead,
W77-10228 5A

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W77-10233 5C

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W77-10241 5C

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W77-10249 5C

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W77-10253 5A

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W77-10354 5D

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W77-10407 5C

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W77-10611 5D

Comparison of Bacterial and Algal Utilization of Orthophosphate in an Estuarine Environment,
W77-10760 5C

ACARTIA TONSA
Summer Zooplankton Distribution in a Georgia Estuary,
W77-10756 5C

ACCIDENTS
United States V Atlantic Richfield Company (Absolute Liability for Oil Spills Under Federal Water Pollution Control Act).
W77-10484 6E

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Critical Thermal Maxima of Two Species of Estuarine Fish,
W77-10258 5C

ACCRETION (LEGAL ASPECTS)
De Simone V Kramer (Artificially Created Accretion Subject to Law Concerning Natural Accretion).
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ACCUMULATION FACTORS
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Effects of Acid Precipitation on a Small Acid Lake in Southern Norway,
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Chemistry and Vegetation of Highly Acidic Streams,
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ACID PRECIPITATION
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A Presentation of the Norwegian Effect 'Acid Precipitation-Effects on Forest and Fish',
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ACIDITY
Brown Trout (Salmo Trutta L.) Growth at Reduced PH,
W77-10227 5C

Sodium Bicarbonate Treats Acidic Industrial Wastes,
W77-10347 5D

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W77-10627 5D

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Removing Carboxylic Acids from Aqueous Wastes,
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SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W77-10165--10172 10270--10287	26
Cornell University, Policy Models for Water Resources Systems	W77-10288--10301 10418--10419 10439	17
ERDA Oak Ridge National Laboratory, Nuclear Radiation and Safety	W77-10384--10417	34
Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W77-10335--10360 10532--10550 10576--10581 10583--10597 10599--10639 10641 10643--10654	120
Illinois State Water Survey, Hydrology	W77-10103--10136 10302--10323 10325--10334 10420--10438 10440--10443 10655--10685 10687--10689 10762--10778 10780--10800	161
Institute of Paper Chem., Water Pollution from Pulp and Paper Industry	W77-10690--10700 10702--10705 10709--10723 10761	31
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University of Wisconsin, Water Resources Economics	W77-10157 10746--10751	7
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W77-10101--10102 10173--10185 10263--10269 10366, 10512	24
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C. OTHER (CONTINUED)		
Environmental Information Services, Inc. (Effects of Pollutants on Aquatic Life)	W77-10227--10230 10232--10237 10239--10249 10251--10262 10361--10365	38
National Oceanic and Atmospheric Administration	W77-10186--10189 10502--10508 10510--10511	13
U. S. Geological Survey	W77-10552--10575	24

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

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